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Farm Chemicals

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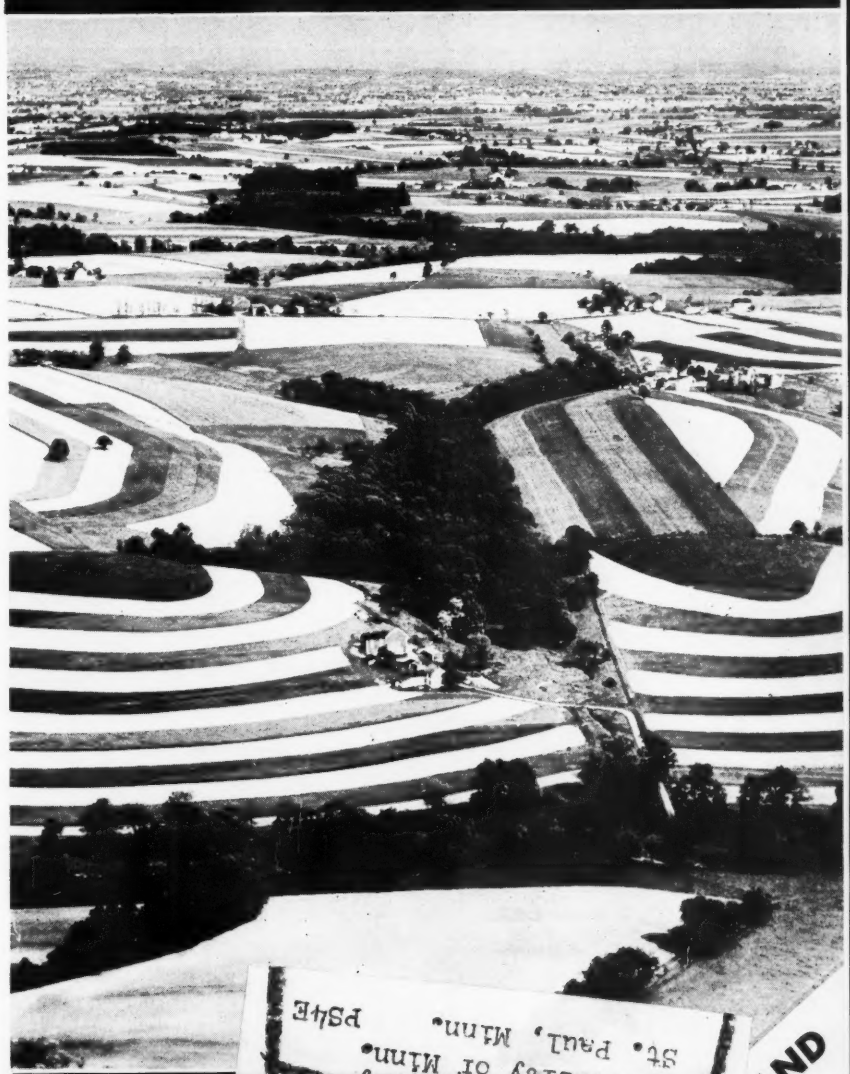

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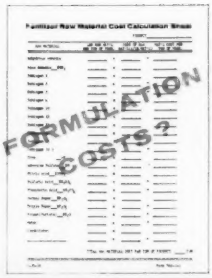

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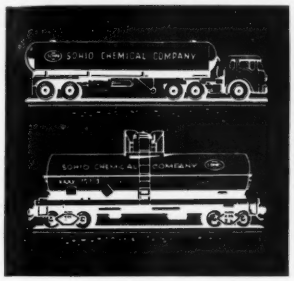

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Farm Chemicals

Vol. 121 No. 6 JUNE 1958

PIONEER JOURNAL OF THE INDUSTRY

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Editor . . . . . LEE WILCOX
Associate Editor . . . . . PHYLLIS MARRON
Wash. Bureau Chief . . . . . JOHN HARMS
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IN THIS ISSUE

▶ An unannounced theme at the third annual NPFI convention this month will be change. In farmers' attitudes toward fertilizer and in their fertilizer practices, in plants growing as they respond to fertilizer, and in our national economy, change can be strongly desired, fascinating, puzzling, frightening, and promising. But whether we like it or not, change is always with us. For more about change and the convention, see **page 10.**

▶ John Harms tells how each of four major stands on the government-farmer relationship can influence the plant food market in "Farm Policy and Fertilizer Sales" on **page 15.**

▶ Ample total supply of pesticides is expected this year. Discussion and tables—including production, supplies, exports, farm expenditures for pesticides, value of shipments, and aerial application—begin on **page 22.**

▶ Nine new high-analysis fertilizers: Their production processes and results in greenhouse and field experiments are described for you—in an exclusive article beginning on **page 27.**

▶ In another FARM CHEMICALS exclusive, T. P. Hignett says that plant-scale studies are needed to solve the problem of nitrogen losses in the production of high-nitrogen granular fertilizers. His pilot plant experience and conversations with fertilizer manufacturers have led to his recent observation that "the cause of high-nitrogen losses is not entirely and perhaps not primarily neglect of well-recognized ammoniation principles." With his discussion, he suggests lines of attack for better nitrogen recovery. . . . **page 41.**

COVER PICTURE

The summer face of the land, happily clothed in the symmetrical patterns of conservation agriculture, can create many stirring feelings when viewed from the air. The man flying or standing on a mountain top is apt to be filled with wonder and pride. Those of us in the farm chemicals industry can appreciate the complex soil and crop problems underlying the apparent simplicity of the scene, knowing we've helped solve many, and must solve many more.

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VIEWING WASHINGTON

with Farm Chemicals Washington Bureau

on agriculture

The big farm chemicals market is expected to continue expanding in the years ahead. The long-time trend is solidly established, according to Agriculture Department experts, with changes in the rate of market expansion now depending primarily upon major shifts in emphasis made in federal farm programs. (See page 15.) Farm economists generally believe that the low point in farm income now has been passed--probably for a long time to come--and that basic trends indicate farm income levels will be steady to higher in the foreseeable future.

A major factor contributing to chemicals market expansion is the growing dependence of farms on industry generally for production items. The USDA declares: "Farmers are becoming more dependent on industry." For example: USDA reports that on 21 of 29 types of farms studied, more than 2/3 of the total cash expenditures in 1957 were for nonfarm goods and services. This was true on only 16 of these 29 farms as recently as 1955--just two years earlier. Furthermore, cash outlays for nonfarm goods and services exceeded 50% of total cash expenditures on 24 types of farms in 1955 and 27 types in 1957.

Farmers' growing dependence on industry, according to the study, "is a reflection of farmers' efforts to reduce costs and increase earnings by expanding volume of production, production per hour of labor, and production per unit of input."

Total farm expenditures for production goods and services of nonfarm origin are running above $10 billion a year. Almost 1/6 of that goes for buying fertilizer, lime, and pesticidal chemicals. During 1957, the USDA reports, farmers spent about $1.3 billion for fertilizer and lime, compared with $1.2 billion in 1956. For pesticides, farmers spent almost $260 million in 1957, compared with about $222 million in 1956. Economists point out that the rising trend of chemicals purchases continued during the recent farm depression--which now apparently is a thing of the past.

Current farm expenditures for production items--$10 billion--are more than 4 times the total spent annually for such goods and services in 1935-39. USDA says price increases account for about half the increase in these expenditures. Fertilizer cost rate increases since 1935-39 are put in a favorable light by a recent USDA report. It says that since 1935-39, building & fencing materials farm cost rates have gone up 170%; motor vehicles, 161%; farm machinery, 136%; farm supplies, 110%; motor supplies, 63%; and fertilizer farm cost, up only 48%--which represents the smallest increase in industrially-produced farm production items.

VIEWING WASHINGTON

agriculture continued

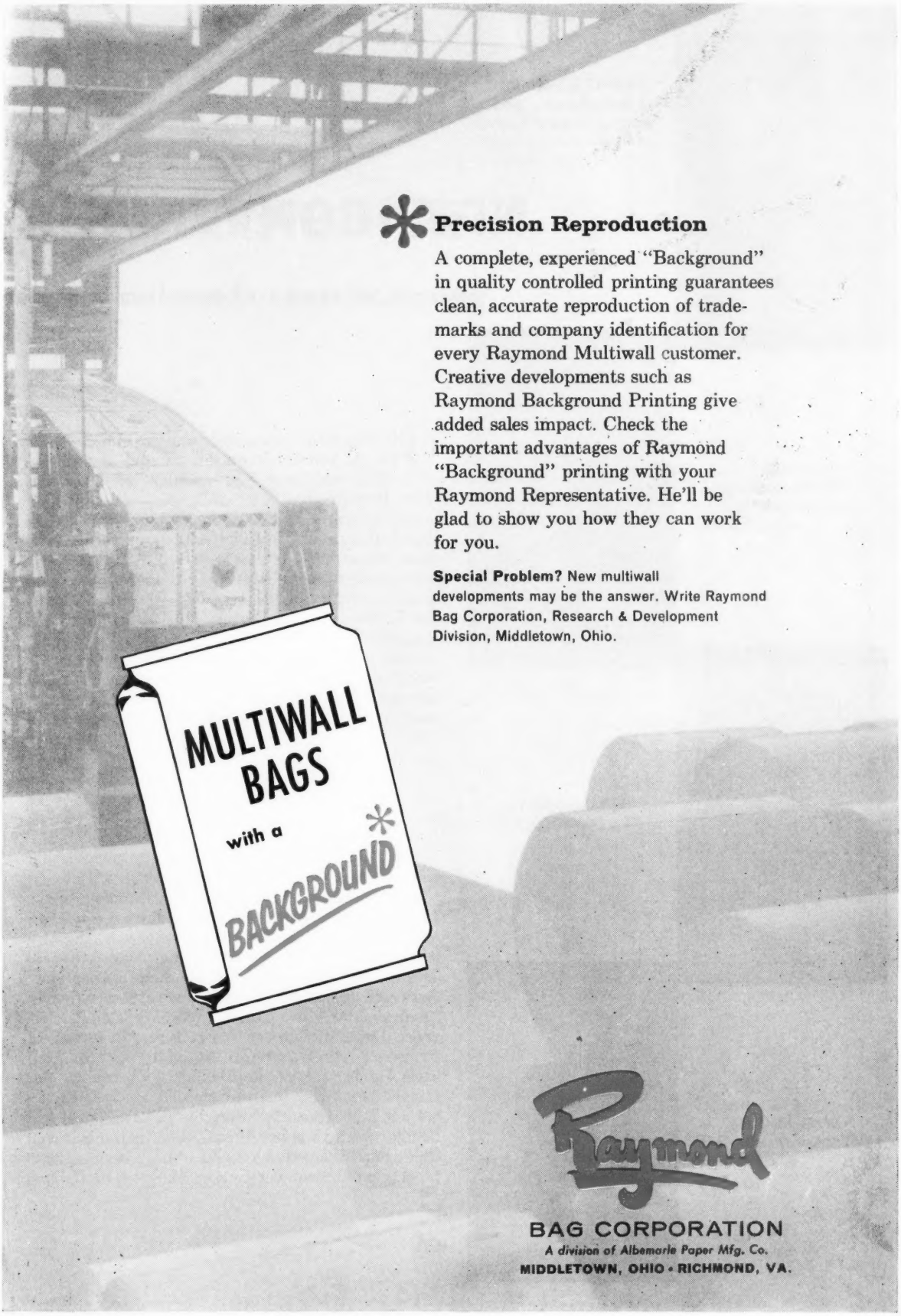
Since 1947-49, the increase in farm cost of fertilizer materials also has been dramatically slower than for all other production items bought from industry. Between 1947-49 and this spring, fertilizer cost has gone up a bare 6%--contrasted with boosts of 45% in motor vehicles, 51% in farm machinery, 32% in building & fencing materials, 25% in farm supplies, and 21% in motor supplies.

What is the size of the chemicals market for the decades ahead? An idea of the vast potential is outlined by Byron Shaw, administrator of USDA's agricultural research service. Shaw says it simply, in his call for much more basic research. He says that in "planning for tomorrow," agricultural scientists will need: "First, to continue research to help farmers hold their own. Second, scientists will have to give farmers the means of producing today's commodities on fewer acres, with less labor, and at lower cost. Third, if our population reaches 230 million in 1975, as expected, fewer farmers will have to produce 35% to 40% more food, feed, and fiber from about the same number of acres in production today."

The upward spiral of farmland prices is slowing down--and may stabilize in the months ahead, nationally. The USDA reports that land values increased only 1% since November, but now stand 6% higher than last spring. Official real estate reporters now for the first time believe prices of "average" farms will decline this summer. "Good" farmland prices are expected to increase still more in West North Central states, but to remain steady and to lower elsewhere in the eastern half of the country. In the Western Mountain region, grazing land prices are expected to continue upward, with little change in prices of irrigation and dry farming land. Pacific Coast states are likely to see increases in dry farming and grazing land, but some decline in irrigated land this summer.

Average value per acre of farmland by producing regions, as of March 1, 1958: Northeast, $233.80; Corn Belt, $206.47; Lake states, $137.74; Appalachian, $119.75; Southeast, $100.06; Delta states, $104.00; Southern Plains, $72.07; Northern Plains, $66.31; Mountain, $32.85; Pacific, $194.20. U.S. average: $100.93.

The Agriculture Department has a new fertilizer-use kit to determine the most profitable plant food applications. Consisting of standard-yield curves and a table, the kit was developed by D. B. Ibach, agricultural economist. USDA says the kit simplifies calculations usually required to determine the best use of fertilizer after experimental plots have been treated with various amounts of nutrients. Sells for $3, Division of Photography, Office of Information, USDA, Washington 25, D.C.



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NPFI CONVENES AT T

panels discuss changing farmers' fer

ORVILLE BUERGE
"The Dealer's View"

HARRY RASH
"The Banker's View"

W. E. McGUIRK
"What Can Industry Do?"

ONE thousand. That's the number of persons expected to attend the third annual convention of the National Plant Food Institute at the Greenbrier, June 15–18.

Those present at the White Sulphur Springs, W. Va., gathering will include fertilizer manufacturers, scientists, and agricultural leaders.

Principal speaker will be Fred C. Scribner, Jr., Under Secretary of the Treasury, who will speak at the Tuesday morning session. His topic: "The National Economy—Today and Tomorrow."

Other prominent features on the program will include two panels on "Changing Farmers' Attitudes Toward Fertilizer" and "Changing Farmers' Fertilizer Practices" plus a time-lapse motion picture on "Watching Fertilizer Work" by the nationally-known producer John Ott of Winnetka, Ill.

Meetings of the Institute's Executive Committee and Board of Directors are scheduled for June 15 and a meeting of the Board will also be held on June 18.

The annual business meeting of the membership will be held at the morning session on June 16.

John A. Miller of Louisville, Ky., President of the Institute, will preside at the convention sessions.

On Monday, June 16, the program will feature a panel discussion on "Changing Farmers' Attitudes Toward Fertilizer" with Dr. M. S. Williams, Chief Agricultural Economist of the Institute, speaking on "Farmers' Present Attitudes"; Dr. Webster Pendergrass, Dean, College of Agriculture, University of Tennessee, on "What Can State Agricultural Colleges Do?"; and W. E. McGuirk, Chairman, National Plant Food Institute Special Study Committee, on "What Can Industry Do?". The panel will be followed by a presentation "What is the National Plant Food Institute Doing" featuring brief regional reports on the subject by Dr. Richard B. Bahme,

THE GREENBRIER

fertilizer attitudes and practices

JOHN OTT, who will present his time-lapse motion picture "Watching Fertilizer Work," is seen here through windows of his studio.

Western District Representative; Zenas H. Beers, Midwest Regional Director; Dr. Samuel L. Tisdale, Southeast Regional Director; Dr. Robert L. Beacher, Southwest Regional Director; Dr. Willard H. Garman, Northeast Regional Director; and F. Todd Tremblay, Pacific Northwest District Representative. W. R. Allstetter, Vice President of the Institute, will introduce the panel members. The annual business meeting will follow.

In the afternoon, a panel discussion will be conducted on "Changing Farmers' Fertilizer Practices" sponsored by the Institute's Research and Education Committee, with A. H. Bowers as chairman and moderator. Other speakers and subjects for the panel are: Orville-Buerge, Buerge Brothers, Harrisonvile, Mo., on "The Dealer's View"; J. W. Clark, Dane (Wisconsin) County Agricultural Agent, on "The County Agent's View"; and Harry Rash, President, First National Bank, Thayer, Kans., on "The Banker's View."

On Tuesday, June 17, the session will open with a film presentation on "The Salesman," a FORTUNE film Production, followed by the time-lapse film presentation by Mr. Ott. A memorial resolution will be presented by the Chairman of the Institute's Memorial Committee, C. B. Clay, and the feature address of the session will be delivered by Mr. Scribner.

The annual banquet will be held Tuesday evening, June 17, at which Dr. Russell Coleman, Executive Vice President of the Institute, will present scrolls to the two winning editors in the Sixth Annual Nation-wide "Soil Builders Award for Editors" contest, and following will be an outstanding entertainment program.

A special ladies' program will include: A garden party, film presentation on "Flower Fantasy" by Mr. Ott, tennis and golf tournaments, bridge and canasta party, and golf putting contest.

A. H. BOWERS
Chairman and moderator for panel on "Changing Farmers' Fertilizer Practices"

J. W. CLARK
"The County Agent's View"

DR. WEBSTER PENDERGRASS
"What Can State Agricultural Colleges Do?"

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reports Damon Robinson
Manager, Plant Food Division
Kelly-Weber & Company, Inc.
Lake Charles, La.

International's Charter Carports of Triple dock at the Port of Lake Charles "just a stone's throw" from the Kelly-Weber plant at Westlake. Triple is transferred by dragline to dump trucks. At the plant, Triple is elevated from hopper into storage area. In addition to the triple, all phosphate rock (storage piles in the background) and sulfuric acid are shipped by water.

60 years with the company is the record of Arthur Gayle, President and General Manager of the entire Kelly-Weber organization. He maintains a special interest in operations of the fertilizer division.

Best selling grades . . . such as 5-20-20, 10-20-10, and 12-12-12 for rice . . . are formulated with International's Triple Super. The Westlake plant formulates 15 different grades of fertilizer.

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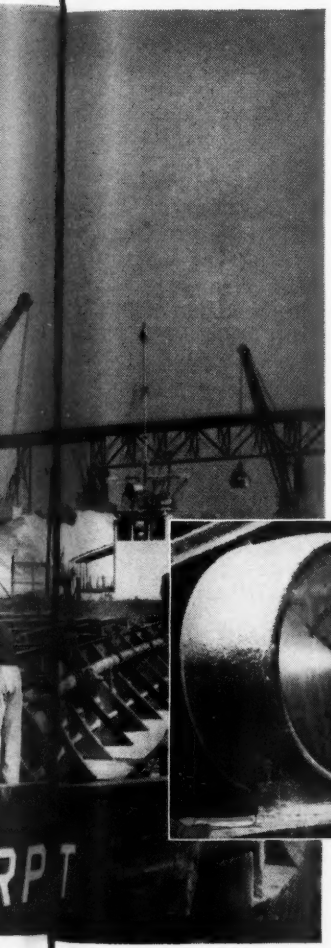
"And International's Charter Carports of Triple help us use our 'water life-line' to best advantage"



For some 32 years, the Kelly-Weber plant at Westlake, La., has been making use of their Lake Charles "water life-line."

"We get our Triple by carport from International (at Tampa, Fla.)," says Plant Manager Damon Robinson. "Their regular carport shipments help us meet peak season schedules . . . no worry about unloading or handling, either."

The Westlake plant is closely related to the ship channel that connects Lake Charles and the Gulf of Mexico. Construction of both was completed in 1926 . . . and the first ocean-going vessel to use the channel carried a load of fertilizer.

In those early days, Arthur Gayle managed the fertilizer division. Together with his son, W. Gedge Gayle, and Damon Robinson, he developed a growing market for Weber-King brand fertilizers. An acidulation plant was built in 1944 . . . a granulation unit installed in 1954. International's Triple Super is an important ingredient in the high-analysis, granular fertilizers their farm customers require.

If you're not already using International's Triple Super investigate now. Learn how you too can benefit from International's superior quality triple . . . guaranteed minimum 46% APA . . . and service tailored to meet your requirements. Write or wire your International man for full details.

Basic goods are weighed into batch hoppers by Cleveland McCraney. In addition to operations at the Westlake plant, non-nitrogenous grades are produced in plants at Lake Charles and Eunice, La.

Strong demand for Weber-King fertilizers carries over from planting season into top-dressing, then fall pasture seasons. Sales area covers southwestern Louisiana and southeastern Texas.

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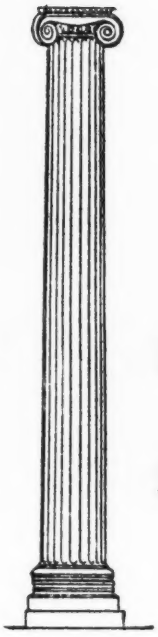
Farm POLICY and Fertilizer SALES



BY JOHN HARMS

NATIONAL farm policy is in a state of flux. The direction it finally takes will have a direct bearing on fertilizer sales of the future.

Industries selling the farm market find it increasingly necessary to acquaint themselves with federal farm policy. What is done on the national level to regulate farm production is a matter of dollars-and-cents concern to industry. To a considerable degree, the course of farm programs and policies in the past have determined levels of spendable farm income. *There is every evidence today that this will hold true in the future.*

National agricultural policy is on the threshhold of change. Federal officials, farm leaders and legislators recognize that present laws must be adjusted to meet the needs of rapidly changing technology and economics in agriculture. Federal farm policy is lagging seriously behind the "technological explosion" taking place in the farm sector of our economy.

There is no question that changes in federal programs and policies are coming. All signs indicate that adjustment of such programs will be made over a period of years. There also is considerable evidence that major or minor revisions might have to be made constantly to keep policies and laws abreast of the changing agricultural scene.

Although Congress now is embroiled in conflict trying to develop a so-called long-range omnibus farm bill, chances of enactment are slim. The debate over this major legislative proposal, however, is not likely to be in vain. It is looked upon by some students of farm economics and policy as the tortuous *beginning* of new farm policy. It may be, they believe, the first step in evolving agreement on the *direction* farm programs for the future need to take. Agreement on the broad direction would be a major contribution to eventually developing the specific details of a program.

Involved in current legislative deliberations are four major elements, any one of which—or a combination—could form the basis of future farm programs. It is from these elements that the seeds of the "new look" in agriculture policy will spring, eventually. Because of this, it is vital that we recognize the possibilities for the fertilizer market in each.

Following is a brief description of the four approaches involved, and *an analysis of how each may affect the fertilizer market in the years ahead if enacted into law.* The analysis is based on conversations with key people involved and studies of the programs where they shed light on possible effect on the plant food industry. The analysis is limited to the major fertilizer-use crops—cotton, corn and other feed grains, tobacco, and wheat.

CONGRESS

At press time, the House Agriculture Committee neared completion of its version of an omnibus farm bill. While it is a hybrid of various of the foregoing proposals it stands as the fourth major element in the current efforts to develop a new farm program direction.

On feed grains, the committee proposals would permit growers to choose between 3 alternative programs: 1. No acreage limits plus support at 90 per cent of the average market price the past 3 years: 2. Strict acre controls, marketing quotas, and support at 80 per cent of parity, and 3. No controls and no price support.

On cotton, if growers favor controls in a referendum, each grower would have a choice in 1959 of: 1. Complying with allotments (about 20 per cent

below this year) and supports at about 84 per cent of parity, or 2. A 30 per cent boost in allotments with supports at 65 per cent of parity. The wheat program is similar to the Grange proposals. The present tobacco program would continue.

Harold D. Cooley, chairman of the House Agriculture Committee, says: *"We are doing our best to evolve an over-all farm program which will fit in with the needs of agriculture now and in the years ahead. The Committee has worked up proposals which represent a composite of recommendations of major farm organizations, along with adoption of some provisions of existing legislation. They are intended to strengthen the farm economy and help provide equitable returns for farmers."*

Fertilizer implication: If growers vote against farm programs where referendums would be held, the fertilizer market could be expected to fluctuate in response to probable up-down sequences in farm prices and income. If price supports are continued, they would tend to even out peaks and valleys in annual farm price and income trends, depending upon their level. If price supports and allotments are continued, current upward trends in fertilizer consumption are almost sure to continue.

U.S. DEPARTMENT OF AGRICULTURE

Secretary of Agriculture Benson has stepped up his demand for "less government in agriculture," which he has advocated since 1953. Currently, he seeks to obtain authority to reduce all price support levels to a floor of 60 per cent of parity, compared with present 75 per cent. He further advocates removing all legal floors under price supports, with levels to be set at USDA discretion when and if needed. Acreage controls would be eased as supports are lowered—with a 50 per cent increase in allotments as the current goal.

Ezra Taft Benson, Secretary of Agriculture, states: *"We can build a healthier farm economy. But we can do so only if agriculture is kept dynamic and free. Enactment of the President's program would mean we have learned that agriculture's progress comes basically from programs that lower costs, improve quality, expand markets, and give farm people freedom to plant, to compete, to market and to make their own management decisions on their own farms. The farms of America cannot be run from a desk in Washington, D.C."*

Fertilizer implication: If price supports are lowered to 60 per cent of parity, which is near to where farm products could move through marketing channels on their own steam, net farm income probably would drop 20 per cent to 25 per cent, according to studies made of the proposal. This would take place despite efforts to expand farm markets. The impact would be felt in early years of the change, with income probably moving up after the adjustment stage. Fertilizer consumption may drop sharply during the first few years, then fluctuate depending upon the course of farm commodity markets and farm income. The trend to larger, more efficient-type farm operations would be accelerated.

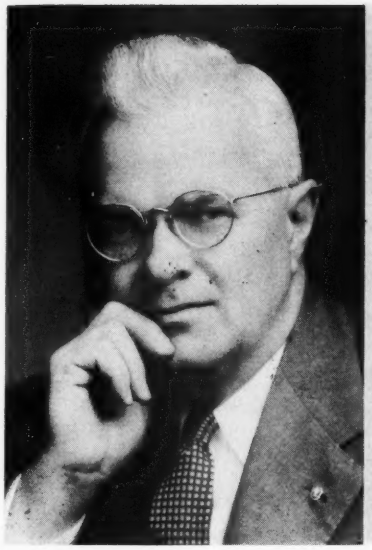
THE NATIONAL GRANGE

The Grange also has come up with a new approach to the surplus feed grain situation. Briefly, it advocates a three-year program designed to remove one-fifth of the total acreage planted to corn and other feed grains from production. It would "retire" about 20 million of these acres into a "conservation base." To maintain income, however, farmers would be offered government-stored grain plus payments for installing conservation practices on idled land. On cotton, the Grange backs direct payments to growers, with cotton going at market levels. Wheat sold on the domestic market would be supported at 100 per cent of parity, with export wheat going at low world prices (two-price system). The tobacco program would continue as-is.

Herschel D. Newsom, master of the National Grange, says: *"Through such programs we would seek to make it possible for American farmers to pay current production costs and living costs out of income*

HAROLD DUNBAR COOLEY (Dem. N.C.) Chairman of the House Agriculture Committee—*For equitable returns for farmers, a composite.*

EZRA TAFT BENSON, Secretary of Agriculture—*Not from a desk in Washington.*



HERSCHEL D. NEWSOM, Master of the National Grange—*Marketing control: restored to private hands.*

CHARLES B. SHUMAN, President of American Farm Bureau Federation—*Price support levels: out of the Secretary's hands.*

that would result from their productive and marketing operations. Among other things, the new programs must raise farm income to provide equitable return on invested capital and labor, restore marketing control of farm products to private hands, and permit American products to compete in world markets."

Fertilizer implication: The Grange proposals are steps aimed at increasing farm income directly. To the extent that they would increase spendable income, they amount to a plus-factor to the fertilizer market. The big reduction in corn and other feed grain acreage may bring about a net reduction in plant food used on corn and other grains, although much of this probably would be offset by the incentive to continue boosting per-acre yields. In the short run, the rate of acre retirement for a time may exceed the rate of increasing fertilizer applications.

Direct payments on cotton, parity supports for wheat sold domestically, and continuation of current tobacco programs would tend to continue generally increased fertilization.

AMERICAN FARM BUREAU FEDERATION

Farm Bureau this year proposed a new approach to price supports for cotton and corn. Under the proposal, price supports for these commodities grown in 1959 and succeeding years would be set at 90 per cent of their weighted average market prices during the preceding three-year period. Corn allotments would be abandoned, and cotton allotments would be set "to meet projected demand."

On wheat, Farm Bureau advocates farmers be given a "realistic choice" in a referendum between: 1. The present program coupled with controls strict enough to eliminate the surplus and balance production with market needs, and 2. Lower supports with no control on production. On tobacco, the proposal is to continue the present program of marketing quotas, allotments and high price support.

Charles B. Shuman, president of AFBF, declares: "*This system of price supports would facilitate orderly marketing of farm commodities rather than attempt to guarantee unrealistic prices. It takes account of competitive conditions, supply and demand, and market trends. At the same time it avoids the determination of support levels by any Secretary of Agriculture at his discretion.*"

Fertilizer implication: On corn, there would be no noticeable impact during early years of operation. However, abandonment of allotments coupled with progressive reduction in price supports very likely would remove some pressure for increasing per-acre yields. Gradually any incentive for producing for government loans would be erased, and spur to using fertilizer would wax and wane closely with hog production. On cotton and tobacco, fertilizer-use incentive would be maintained.

On wheat, choice No. 1 would lead to increased use of fertilizer materials, unless controls are put on a bushel basis—which would bring about reduced fertilization. Choice No. 2 very probably would encourage more plant food application.

What is *likely* to happen on the farm policy front? Most Washington observers look at it this way: The omnibus farm bill of the House Agriculture Committee will come up for votes first. If it clears Congress, it most likely will be vetoed by the President because it does not contain the Benson farm plan, although it does contain elements of it. Then an effort will be made to get across "emergency" cotton legislation to head off an automatic acreage allotment cut from the current 17½ million acres, which is indicated in the present law.

In short, it is probable that no genuinely basic change in farm laws will be completed this year; the same programs will be in force in 1959, at least. The long-time pressures on farmers to increase per-acre yields through better management—which usually includes the application of more fertilizer—will continue unabated. ▲

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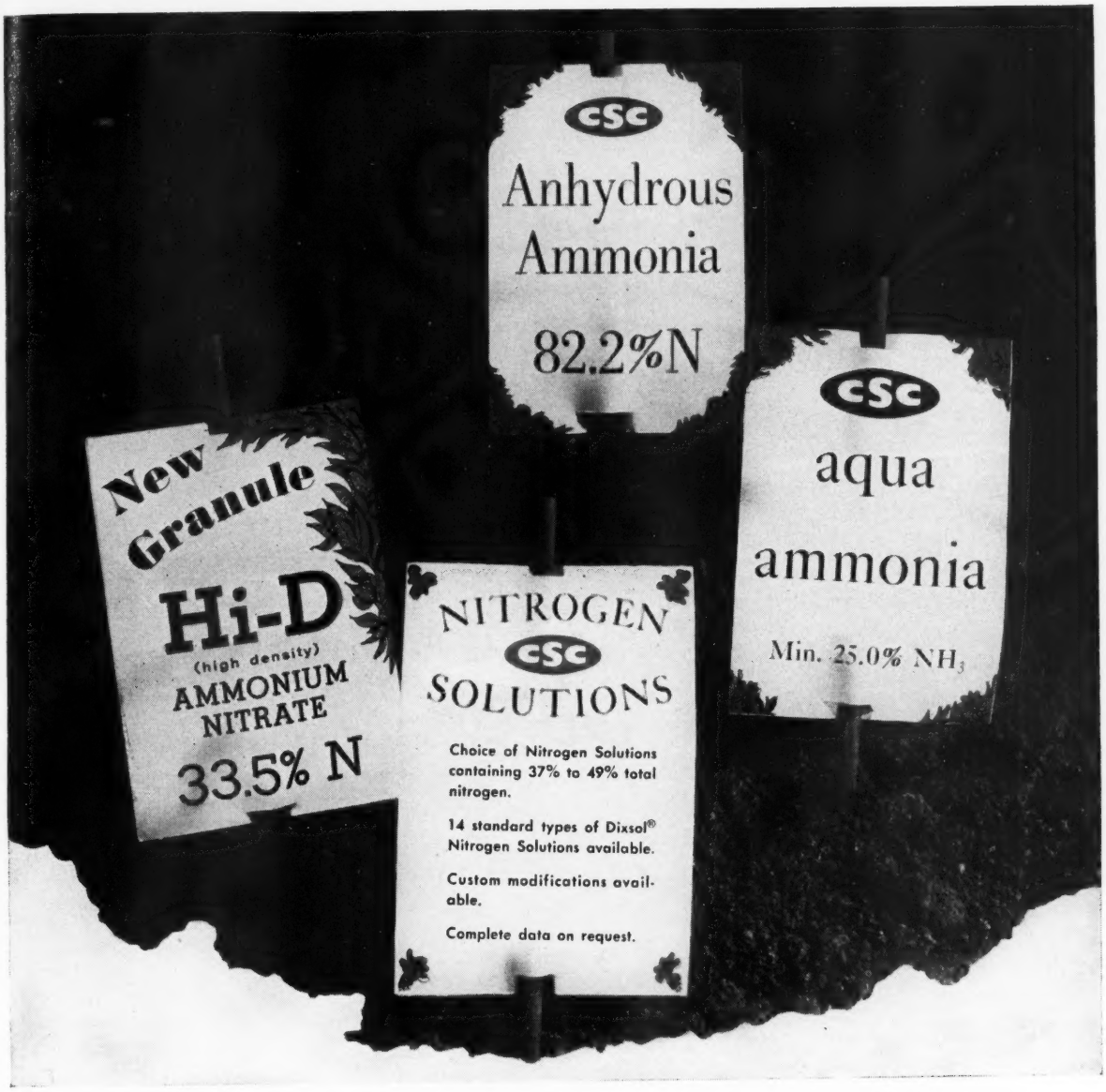

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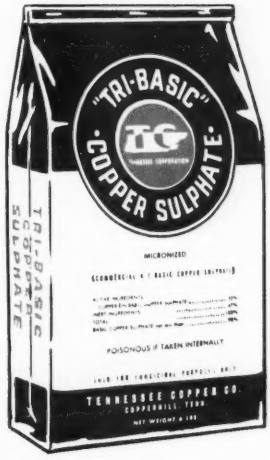

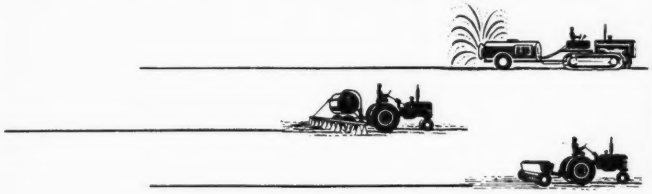

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the PESTICIDE SITUATION for 1957-58

TOTAL SUPPLY of pesticides is expected to be ample this year.

Harold H. Shepard, of the Commodity Stabilization Service, U. S. Department of Agriculture, reports that requirements for older materials—in commercial use for several seasons—"should be met with relative ease."

"Pesticides recently developed to compete with the older ones or to meet special needs are those most likely to be in short supply," says Shepard in the recently released 23-page report on the pesticide situation for 1957–58.

Some downward adjustments in 1957 production schedules for pesticidal chemicals were apparently made, as shown at right This was especially true for ben-

(*Continued on page 24*)

Farm Production Expenditures in 1955 for Pesticides

Nature of use		Expense ($1,000)
Pesticides for growing crops		**180,884**
for killing weeds, brush, etc.		47,017
for insects in stored farm products		3,213
for rats, gophers, and other animals		6,594
for termites and rot control		2,923
Sprays, disinfectants, etc., for livestock and poultry		**37,614**
for cattle and calves	26,856	
for hogs and pigs	3,863	
for sheep and lambs	912	
for chickens	5,251	
for turkeys	236	
for other and not specified	496	
Pesticides, unspecified expense		5,028
Total expense		**283,273**

Source: "Farmers' Expenditures in 1955," Special Report, U. S. Census of Agriculture, 1954 vol. 3, part 11.

U. S. Production of Some Major Pesticides Calendar Years, 1954-57

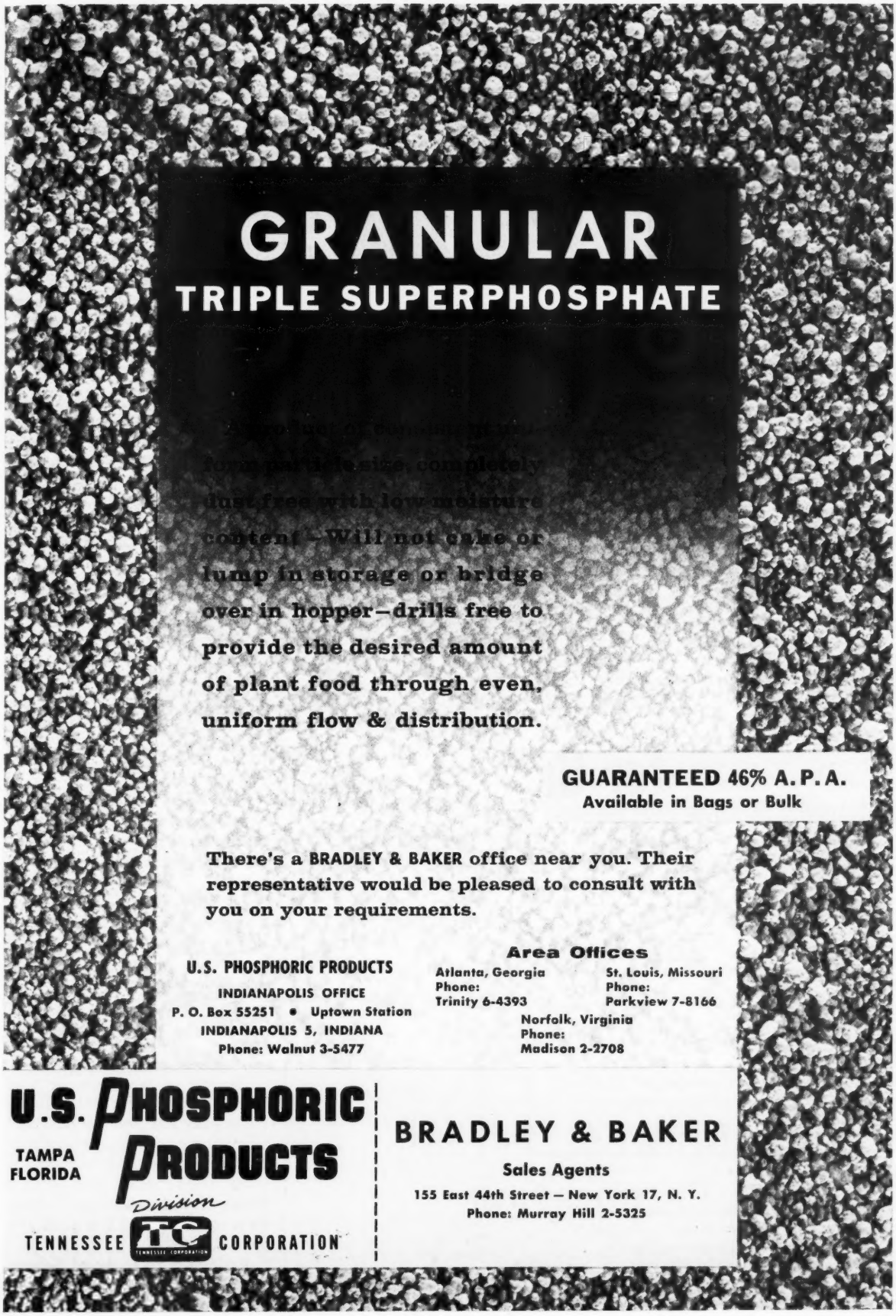
Chemical	1954 1,000 lb.	1955 1,000 lb.	1956 1,000 lb.	1957[1] 1,000 lb.
Aldrin, chlordane, dieldrin, endrin, heptachlor, and toxaphene (combined production)	45,169	77,025	**86,659**[4]	**75,424**
Benzene hexachloride (gross)[2]	76,934	56,051	**84,599**[4]	**39,313**
Benzene hexachloride (gamma equivalent)[2]	11,500	10,700	**14,700**[4]	**6,912**
Calcium arsenate	2,758	3,770[4]	**27,106**[4]	**20,000**
Copper naphthenate	3,557	2,373	**2,012**	[5]
Copper sulfate	130,616	156,176	**133,616**	**141,360**
2,4-D acid	30,184	34,516	**28,835**[4]	**33,413**
2,4-D acid esters	16,994	22,879	**19,476**	**26,824**
2,4-D acid salts[3]	5,642	6,640	**1,766**	
DDT	97,198	129,693	**137,659**[4]	**123,758**
Lead arsenate	15,620	14,776	**11,756**[4]	**13,000**
Methyl bromide	[6]	9,222	**10,204**	[5]
Nabam	[6]	[6]	**5,486**	[5]
Parathion	3,889	5,168	**6,529**	[5]
Pentachlorophenol	[6]	[6]	**31,385**	[5]
Phenothiazine	3,437	6,202	[6]	[5]
Phenyl mercuric acetate	598	692	**693**	[5]
Sodium chlorate	79,904[4]	93,944[4]	**110,136**	[5]
Sodium dimethyldithiocarbamate	471	[6]	**2,179**	[5]
2,4,5-T acid	2,697	2,925	**5,169**[4]	**5,067**
2,4,5-T acid esters	3,883	3,793	**7,045**	[5]
2,4,5-Trichlorophenol	2,785	3,806	**6,735**	[5]
Ziram	1,117	963	**1,436**	[5]

[1]Preliminary. [2]Not including lindane grade. [3]Sodium and amine salts. [4]Revised figure. [5]Figure not yet available. [6]Figure not publishable because it would disclose individual operations.
Sources: U. S. Tariff Commission; U. S. Bureau of the Census; U. S. Bureau of Mines.

Disappearance by Crop Years and Minimum Requirements in 1957-58[1]

Pesticide	Domestic disappearance 1954-55 1,000 lb.	1955–56 1,000 lb.	1956-57 1,000 lb.	Minimum requirements for domestic consumption in 1957-58 1,000 lb.
Aldrin, chlordane, dieldrin, endrin, heptachlor, and toxaphene (combined)[2]	54,400[8]	61,570	**52,500**	**45,000**
Benzene hexachloride[3]	7,800	9,450	**6,600**	**8,000**
Calcium arsenate	3,911[8]	23,000[8]	**18,250**	**15,000**
Copper sulfate[4]	77,988	74,920[8]	**78,600**	**30,000**[8]
2,4-D (Acid equivalent)[5]	28,000	28,000[8]	**24,500**	**25,000**
DDT	61,800	75,000	**71,000**	**65,000**
Lead Arsenate	13,269[8]	11,500[8]	**12,000**	**10,000**
Pyrethrum[6]	7,644[8]	6,961	**7,396**	**7,000**
Rotenone[7]	5,954	6,350	**6,224**	**6,000**
2,4,5-T (acid equivalent)[5]	2,500	4,400[8]	**2,200**	**2,500**

[1]Based on available information; crop year is from October 1 to the following September 30. [2]Corrected for exports only at basic producer level. [3]Gamma isomer basis; includes lindane. [4]Disappearance for all domestic uses including industrial; requirements for agriculture only but include plant nutrient as well as fungicide use. [5]Export data not being reported separately, figures represent total disappearance at producers' level. [6]Imports; includes estimated flower equivalent of imported pyrethrum extract. [7]Imports; includes cube and derris, both whole root and powdered. [8]Revised figure.



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zene hexachloride which, on the gamma basis, was down to 47 per cent of 1956 production.

Domestic disappearance during the 1957 season of such major pesticides as benzene hexachloride, calcium arsenate, DDT, 2,4-D and 2,4,5-T was down appreciably from the previous year. This disappearance at the producers' level is calculated by applying to the production figure any inventory change taking place during the period and subtracting exports if these are known.

Organic phosphorous insecticides, such as malathion and methyl parathion, continue to grow in importance. Parathion (ethyl parathion) remains of major significance. Other phosphates, in increasing numbers, are in pilot plant or commercial production. Over a dozen of these have been registered, mostly for application as sprays and dusts. Others are limited to seed treatments or to internal medication of certain livestock.

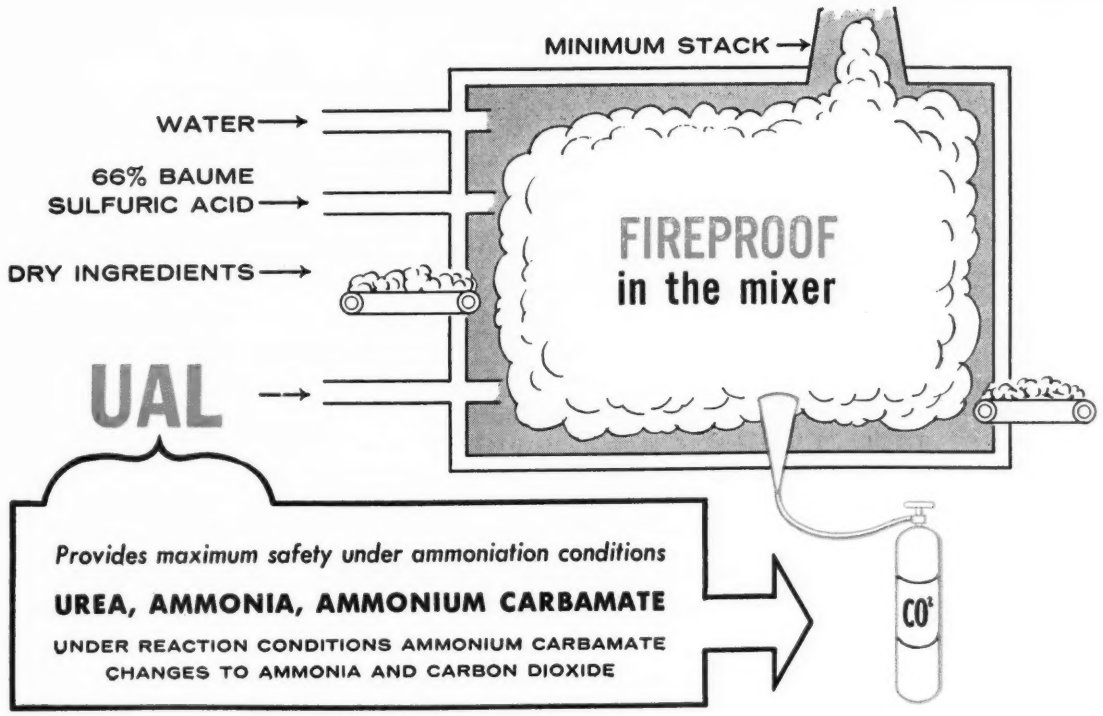
Combined production of the aldrin, chlordane, dieldrin, endrin, heptachlor and toxaphene group during the 1956–57 **crop year** amounted to 73,914,000 pounds, compared to 80,424,000 pounds for the previous 12 months. In 1957 use of these chemicals for boll weevil control suffered in some areas from competition by phosphorous insecticides and calcium arsenate.

Production of inorganic pesticides (arsenical insecticides, copper sulfate for fungicide use, sodium chlorate and boron chemicals for herbicides and defoliants, zinc sulfate, and ground sulfur) has remained fairly constant for several years. This inorganic production is roughly 450 million pounds annually, nearly two-thirds of which is ground sulfur.

Exports of pesticides in 1957 increased 5.1 per cent in dollar value over the previous calendar year. Some notable increases were in calcium arsenate, copper sulfate, DDT, and paradichlorobenzene, as shown by preliminary data on exported pounds of materials.

Estimated in terms of flowers, U. S. imports of pyrethrum by

(Continued on page 26)



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Value of Pesticide Shipments by U. S. Manufacturers, 1947, 1954 and 1955

Class of products	1947 Value of shipments ($1,000)	1947 Per cent of total	1954 Value of shipments ($1,000)	1954 Per cent of total	1955 Value of shipments ($1,000)	1955 Per cent of total
Agricultural insecticides and fungicides	83,356	70.1	177,956	64.7	195,103	64.2
Household insecticides and repellents	27,653	23.2	60,635	22.1	67,876	22.4
Weed killers	7,924	6.7	36,344	13.2	40,807	13.4
Totals	118,933	100.0	274,935	100.0	303,786	100.0

Source: 1955 Annual Survey of Manufactures, Series MAS-55-2, "Value of shipments of selected classes of products for the United States: 1955, 1954, and 1947."

crop years have been fairly uniform since 1951, varying in the seven-year period from 6,700,000 to 8,100,000 pounds flower equivalent with an annual average of 7,385,000 pounds having a content of nearly 100,000 pounds pyrethrins.

Nicotine production in the United States appears to be virtually a thing of the past. The principal producing plant for many years was at Richmond, Va.; production there was discontinued in 1957. Exports of nicotine sulfate have risen each year recently from 200,000 pounds in 1954 to 450,000 pounds in 1957, possibly as the result of competition by phosphorous insecticides for domestic use.

Sales of soil fumigants in 1957, largely for nematode control, amounted to an estimated 15 million dollars, compared to barely one million dollars ten years ago. The leading consuming area is the Carolinas, principally tobacco land; second in importance are the pineapple fields of Hawaii. Fumigation of soil for vegetable crops is increasing rapidly, as is treatment of California cotton land. ▲

U. S. Production of Synthetic Organic Pesticides[1]

Calendar year	Production (pounds)	Calculated producers' value
1953	355,953,000	$130,465,670
1954	419,274,000	157,599,020
1955	506,376,000	206,035,400
1956	569,927,000	274,894,750

[1]Includes a small proportion of plant hormones and soil conditioners.
Source: U. S. Tariff Commission.

Manufacturers' Stocks of Pesticides (Technical Basis) September 30, 1957[1]

Material	All stocks reported as of Sept. 30, 1957 (1,000 lbs.)	Percentage of stocks (tech. basis) reported as formulations	1957 stocks as percentage of 1956 stocks (paired reports only)
Aldrin, chlordane, dieldrin, endrin, heptachlor, toxaphene	32,477	19.3	108
BHC, including lindane (gross basis)	21,220	—	—
Same (gamma basis)	5,916	26.4	103
Calcium arsenate	8,259	15.3	168
Copper fungicides	9,328	7.6	80
2,4-D (acid basis)	17,368	40.9	177
DDT	24,252	36.3	77
Fumigants, grain and soil	49,729	—	185
Lead arsenate	3,101	25.0	65
Miticides, miscellaneous	1,317	58.3	85
Organic phosphorous compounds	7,722	37.6	106
Sulfur, ground	30,282	53.6	87
2,4,5-T (acid basis)	4,327	40.6	307
Other fungicides	9,576	31.1	92
Other insecticides	13,524	42.8	136
Other weed killers	16,964	48.3	102
Miscellaneous, including rodenticides	3,400	—	—
Total	258,762	38.3	115

[1]Results of survey by U. S. Department of Agriculture in cooperation with the National Agricultural Chemicals Association.

Aerial Application of Pesticides and Defoliants in the U. S., 1955 and 1956

Activity	Area treated 1955[1] (1,000 acres)	Area treated 1956 (1,000 acres)	Materials dispensed 1955 Dry (1,000 lb.)	Materials dispensed 1955 Liquid (1,000 gal.)	Materials dispensed 1956 Dry (1,000 lb.)	Materials dispensed 1956 Liquid (1,000 gal.)
Insect control, total	36,439	38,667	265,808	51,274	198,075	57,503
Crops, orchards, etc.	27,434	28,088	264,442	41,184	196,313	49,051
Forests	7,236	4,811	411	7,770	262	3,211
Towns	1,506	5,332	218	1,858	246	4,614
Soils	263	436	737	462	1,254	627
Plant disease control	1,229	1,098	15,439	4,787	24,242	3,672
Weed control	5,291	5,641	119	8,649	131	9,793
Brush control	297	568	285	1,047	15	2,010
Defoliation	2,204	1,976	20,680	11,865	8,607	10,958
Total	45,460	47,950	302,331	77,622	231,070	83,936

[1]Revised.
Source: CAA, Office of Flight Operations and Airworthiness.

Some results with new

High Analysis Fertilizers

BY GILBERT L. TERMAN and JULIUS SILVERBERG

ABOUT 20 years ago, mixed fertilizers in the United States contained an average of about 17 units of plant nutrients (per cent N plus per cent P_2O_5 plus per cent K_2O). Now the average is 28 units, and "high-analysis" fertilizers range from 36 to 50 units and higher. Some common high-analysis grades are: 12-12-12, 14-14-14, 5-20-20, and 10-20-20, and higher analysis grades have been and are being developed.

The cost of plant nutrients to farmers is generally lower in high-analysis fertilizers than in those of lower analysis. This is due largely to lower costs for handling, bagging, and transportation per pound of plant nutrients in high-analysis products.

As a result of the increase in content of N, P_2O_5, and K_2O in fertilizers, the contents of calcium, sulfur, and minor elements frequently are less. For example, by changing from ordinary superphosphate (0-20-0) to concentrated superphosphate (0-48-0), sulfur is no longer present in appreciable amount and calcium content is decreased. Changing further to diammonium phosphate (21-53-0) practically eliminates both calcium and sulfur. In some sections of the country and on some soils, these nutrients may need to be supplied separately when very high-analysis fertilizers are used exclusively over a period of years.

The Tennessee Valley Authority, U. S. Department of Agriculture, and fertilizer companies have all contributed to the continuing trend toward use of higher analysis fertilizers. Some of the high-analysis (materials and N-P-K mixed) fertilizers developed by TVA are discussed below.

Superphosphoric Acid (0-76-0)

This high-analysis acid is made in regular plant equipment from elemental phosphorus produced in electric furnaces. It contains 76% P_2O_5 (equivalent to 106% H_3PO_4). About one half of the P_2O_5 is in the ortho form; the remainder is largely in the pyro form. By weight, it contains about 30% more P_2O_5 than the ordinary acid; by volume, it contains 70% more. In comparison, ordinary phosphoric acid contains only about 54% P_2O_5, all of which is in the ortho form. Consequently, considerable savings in handling costs can be expected. This acid is finding important uses in the preparation of high-analysis liquid fertilizers and in making high-analysis superphosphate. For example, liquids of 11-33-0, 10-10-10, 9-18-9, and 7-21-7 grades may be made with superphosphoric acid and ammonia, as compared with 8-24-0, 9-9-9, 7-14-7, and 6-18-6 made with ordinary phosphoric acid.

Certain minor elements also dissolve in larger amounts in liquid fertilizers made from superphosphoric acid. Also, it has been found that superphosphoric acid sequesters the impurities that precipitate in liquid fertilizers made with wet-process phosphoric acid. It, therefore, may be an important tool in advancing the use of wet-process acid in the production of liquid fertilizers. Greenhouse and field experiments indicate that the phosphorus in liquids prepared with superphosphoric acid produced the same yield as did phosphorus in comparable solid fertilizers.

High-Analysis Superphosphate (0-54-0)

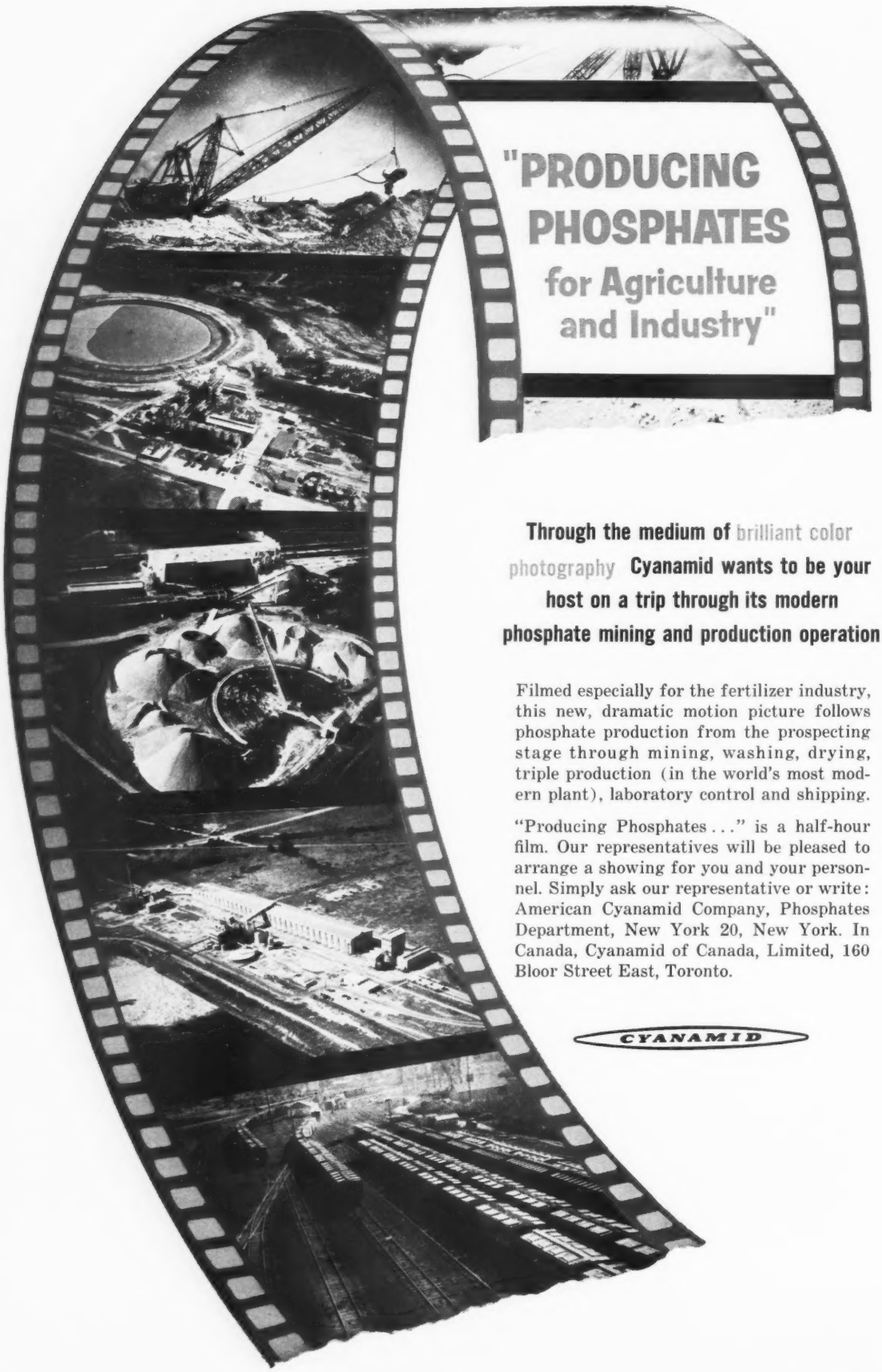
High-analysis superphosphate containing about 54% P_2O_5 is made by TVA by acidulation of phosphate rock with superphosphoric acid in a continuous process. The same cone mixer and conveyor belt are used as for the manufacture of 48% superphosphate. The chief difference in the products is that the 55% superphosphate contains less water. In it the monocalcium phosphate is present largely in the anhydrous form, as compared with the monohydrate form in superphosphates of lower analyses. Some savings in transportation will result from its high analysis. Its water solubility is as high as that of 48% superphosphate. No difference in response to the two forms of phosphate was found in a greenhouse experiment. No difference would be expected under field conditions.

Diammonium Phosphate (21-53-0)

Diammonium phosphate is made by TVA in a crystallization process by reaction of ammonia and phosphoric acid. DP is an excellent water-soluble N-P fertilizer. It may be mixed with potash and other fertilizer materials to produce a wide variety of high-analysis products. It also may be used in formulations for ammoniation and granulation to increase the grade of the product. As an average of

(Continued on page 31)

Gilbert L. Terman is agronomist, soils and fertilizer research branch, Tennessee Valley Authority. Julius Silverberg is supervisor, evaluation section, development branch, TVA.



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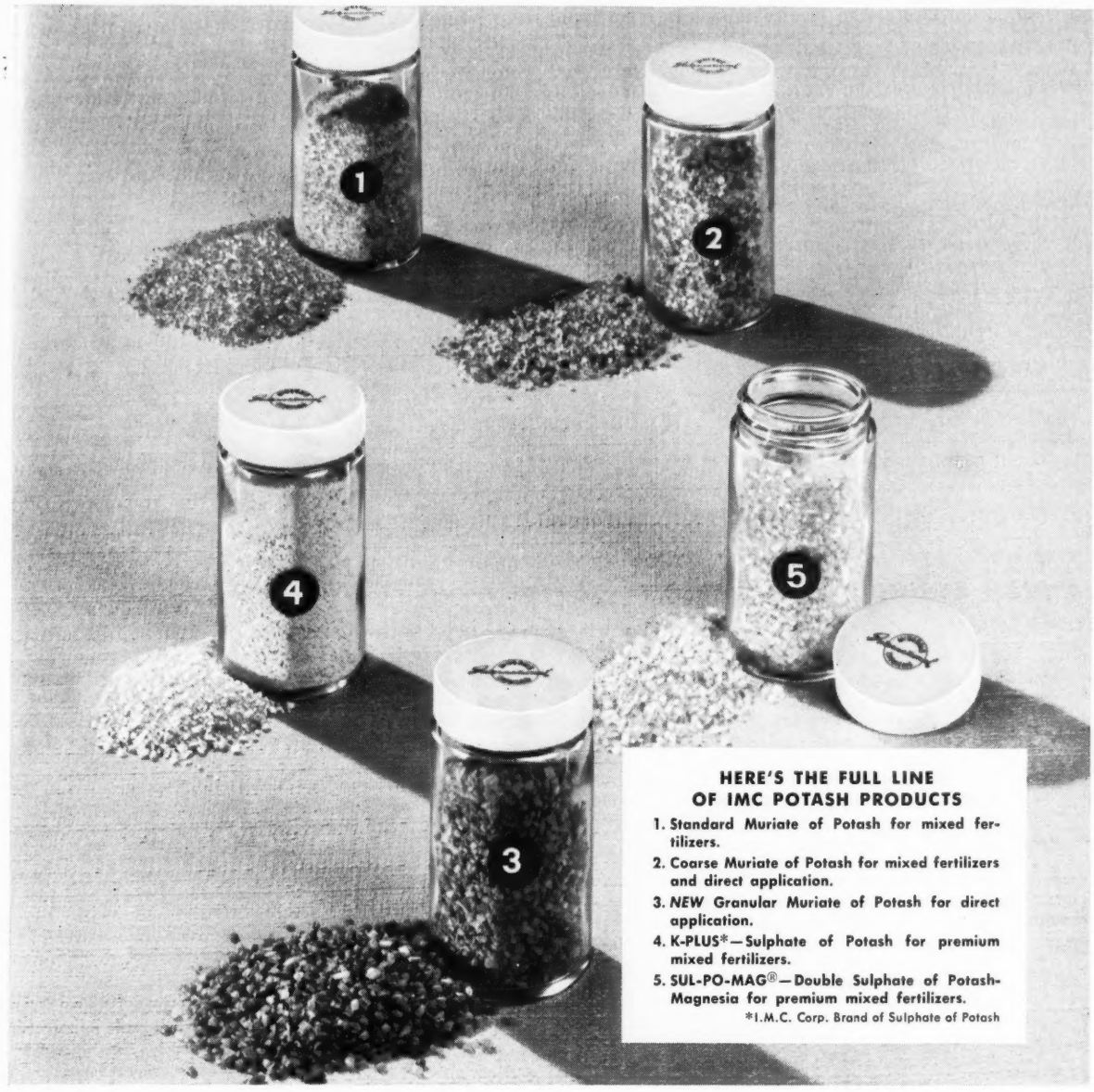

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The following SEQUESTRENE Iron Chelates are available to suit your fertilizer formulating requirements:

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SEQUESTRENE Iron Chelates are available in 50-lb. drums, and 5-lb. bags.

In addition to fertilizer-chelate combination, SEQUESTRENE Iron Chelates may be applied alone as foliage sprays or soil treatments. For resale to the home garden trade SEQUESTRENE Iron Chelates are available in 1-lb. canisters and 4-oz. polyethylene bags.

*"SEQUESTRENE" is the brand name for metal chelates sold by Geigy Agricultural Chemicals, Division of Geigy Chemical Corporation

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82 field experiments in several states, phosphorus in DP produced the same yield as that in 48% superphosphate. The phosphorus is more water soluble and perhaps slightly more available to crops grown on neutral to alkaline soils than the phosphorus in an equivalent amount of highly ammoniated 48% superphosphate. Highly ammoniated 20% superphosphate may be much less available.

Ammonium Phosphate-Nitrates

Ammonium phosphate-nitrates are a class of high-analysis fertilizers that contain ammonium phosphates and ammonium nitrate. Grades such as 11-22-22, 16-48-0, and 17-17-17 have been produced successfully in granular form in TVA's continuous ammoniator pilot plant by reacting phosphoric acid and ammoniating solution. A granular 30-10-0 product has been produced from ammonium nitrate crystals, ammonia, and phosphoric acid in tonnage quantities in demonstration-scale operation. The products are highly soluble in water and have good storage and drilling properties. There is no reason to believe that crop response with these products would be different than with equivalent amounts of nitrogen and phosphorus in ammonium nitrate and 48% superphosphate or diammonium phosphate.

Calcium Metaphosphate (0-62-0)

TVA began producing calcium metaphosphate (CMP) in experimental amounts about 20 years ago. The process consists of burning elemental phosphorus and reacting the P_2O_5 gas with finely ground phosphate rock. The molten glass solidifies and is ground to pass a 10-mesh screen. CMP has been tested in hundreds of field experiments. On acid soils, early growth response is sometimes slow, but yields of grain or hay are usually the same as for 48% superphosphate. Results with CMP on quick-growing vegetable crops may be poorer. On alkaline soils, results with hay and grain vary from equal to superphosphate in response to poorer. Application of CMP on alkaline soils in advance of planting has been best in some experiments.

TVA has studied methods for using CMP in the production of granular high-analysis fertilizers. One process involves partial hydrolysis of the CMP in the presence of a small amount of sulfuric acid. The resulting slurry is ammoniated and granulated. Potash may be added during the ammoniation-granulation step. A 13-13-13 granular product made in this way contains about 50% of its phosphorus in water-soluble form. This fertilizer was compared with 48% superphosphate and other fertilizers in 25 experiments in several states. Crop response was equal to that from comparable N-P-K fertilizers. One interesting result of the reaction of ammonia and metaphosphate is the formation of some water-insoluble nitrogen compounds. Preliminary work, however, has not shown that this nitrogen is slowly available to plants.

A process also was developed for granulating finely ground CMP. In this process the ground CMP is heated and passed through a rotary tumbler in which a small amount of water is added. The product has excellent physical properties, and the P_2O_5 in the granules was as readily available in greenhouse tests as the P_2O_5 in the finely ground material (minus 35 mesh).

Ammonium Metaphosphate (17-73-0)

Ammonium metaphosphate is the name given to the highly concentrated (90% plant nutrients) product obtained by reacting ammonia and P_2O_5 gas at rather high temperatures. The product is predominantly ammonium metaphosphate; the remainder is complex nitrogen-phosphorus compounds. From 40 to 60% of the nitrogen and P_2O_5 are slowly soluble in water. AMP was compared in greenhouse tests and in 30 field tests in several states. Availability of the phosphorus was equal to that in DP or 48% superphosphate.

Because of the probably high cost of production, pilot-plant research of ammonium metaphosphate has been discontinued for the present. Other fertilizers appear to offer more possibilities of reducing costs of plant nutrients to farmers.

Dicalcium Phosphate Dihydrate (0-36-0)

Feed-grade dicalcium phosphate is usually made by reaction of phosphoric acid and lime. In most operations, the product is largely in the anhydrous form (0-48-0). However, if the temperature of the reaction is held below about 120° F., the dihydrate form is obtained. Dihydrate also can be formed in ammoniated superphosphates and nitric phosphates by controlling the temperature during ammoniation. It also may form in dry-mixed fertilizers in which ground limestone is used as a filler or to neutralize the fertilizer. Although some DCP dihydrate has been used in Europe for many years, any used in the United States, except that present in other fertilizers, has probably been the anhydrous form.

In several greenhouse tests availability of phosphorus in the dihydrate to crops has been consistently higher than in the anhydrous material. Both forms are most available in minus 35-mesh sized particles. The fine dihydrate is usually as available as 48% superphosphate on acid soils. Granulation of either form into large granules greatly decreased the rate of dissolution and the availability of the phosphorus to plants.

Fused Potassium Phosphates

Two general classes of fused potassium phosphates have been produced in pilot plants by TVA. One is potassium metaphosphate, made by burning phosphorus and reacting the P_2O_5 with muriate of potash in a furnace. A second product, potassium-calcium pyrophosphate, is made in the same way except that finely ground phosphate rock also is fed to the furnace to supply some of the P_2O_5. The molten product from the furnace is cooled and ground to the desired size. Although composition varies, representative products are 0-58-33 and 0-42-25, respectively. These materials are of interest largely as nonchloride sources of potassium and because much

of the potassium is in a slowly soluble form. Low-chlorine fertilizers are important in the production of high-quality potatoes, tobacco, and certain other crops. Slowly soluble potassium fertilizers are of interest to reduce leaching on very sandy soils and to reduce luxury consumption of potassium by crops.

Results in several greenhouse experiments have shown that the phosphorus and potassium in the fused phosphates are essentially as available as in superphosphate and muriate of potash. Apparently because of rather rapid hydrolysis in the soil, effect on plant growth has not been found to be closely related to water solubility. Leaching of potassium from the fused phosphates, however, has been found to be less in a sandy soil than from muriate of potash. There is a good possibility that potassium in large particle sizes of the materials will be more slowly available. Experiments are in progress to study such large particle sizes.

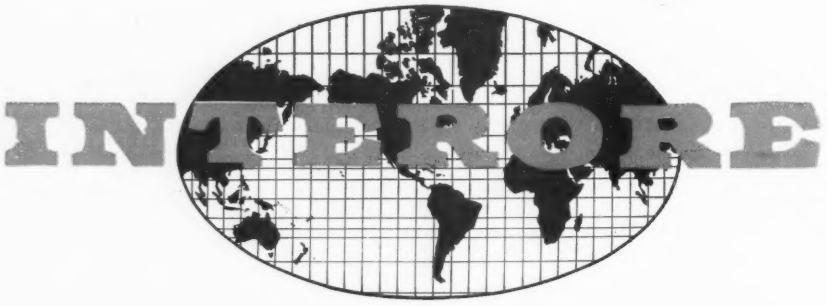
Leached-Zone Fertilizers

Leached-zone ore, which is high in aluminum phosphates, overlies the Florida phosphate rock deposits. TVA has developed a process to utilize this phosphate, which is presently wasted. The phosphorus is extracted from the ore with nitric and sulfuric acids. The resulting slurry is filtered and the filtrate is ammoniated and granulated. Potash may be added in the ammoniation-granulation step to produce N-P-K fertilizers. Typical grades produced in the pilot plant were 20-20-0, 15-15-15, and 24-12-0. (Ammoniation and granulation can be carried out simultaneously, of course, in equipment such as the TVA continuous ammoniator.) Several of the products have been tested in greenhouse and field experiments. The products are unique in having most of the phosphorus present as aluminum phosphates.

Crop response to a typical product, a 15-15-15 containing 30% of its phosphorus in water-soluble form, was the same as to commercial 10-10-10 of similar water solubility. A 15-15-15 in which 10% of the phosphorus was water soluble gave somewhat lower yields.

Other Development Research

TVA is continuing its pilot-plant research on processes for producing granular high-analysis fertilizers. Important progress has been made in granulating phosphate-potash mixtures, in upgrading and granulating mixtures based on ordinary superphosphate, granulation of superphosphates and calcium metaphosphate, and in other areas. For example, a process has been developed for producing superphosphate that can be used immediately in ammoniation and granulation practices. (The usual process is to acidulate and then cure in a den for perhaps a month.) The superphosphate made in the new process has high availability and requires no curing before it is used. ▲



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Arcadian® News

Volume 3 | For Manufacturers of Mixed Fertilizers | Number 6

We Appreciate Your Business

Good customers are the greatest asset of any company. Nitrogen Division, Allied Chemical, is proud of its customers in the fertilizer industry. The end of another fertilizer year is an appropriate time to say THANK YOU for purchasing your nitrogen requirements from us. We appreciate your business and will continue to do our best to deserve your confidence and your loyalty.

We produce for you the most complete line of nitrogen products available for manufacturing fertilizers. You have many different ARCADIAN® Nitrogen Solutions from which to select those best suited to your ammoniation methods and equipment.

Our plants at Hopewell, Virginia, South Point, Ohio, and Omaha, Nebraska, are conveniently located to serve many areas. We maintain the largest fleet of tank cars in the industry and do our utmost to keep our delivery facilities operating at top efficiency. When you need ammoniation advice or formulation assistance, you get it promptly without charge from our experienced technical service staff. The research that originated Nitrogen Solutions is constantly at work, developing new methods and materials to help you manufacture better fertilizers.

Your sales are supported by powerful advertising to sell mixed fertilizers. Farm magazine advertisements, radio broadcasts and billboards, sponsored by Nitrogen Division, Allied Chemical, carry the mixed fertilizer story to millions of farmers.

We look forward to a mutually pleasant and productive relationship with you during the years ahead. If you have suggestions as to how we can serve you better, let us hear from you. If you plan to be in White Sulphur for the Convention, stop by the Nitrogen Division, Allied Chemical, suite at the Greenbrier and let us tell you in person how much we appreciate your business.

Green fields speak as loud as big yields to many farmers. When the corn leaves lap in the row, the oats are shoulder-high, and the pasture is knee-high to cows, any farmer loves to show off his crops. That's a good time to go and see him, if he uses your fertilizer. It's also a good time to show his crops to other farmers.

One farmer applied a double dose of fertilizer to his corn by mistake. He made a big profit on the extra tonnage of silage produced by the extra fertilizer. But he didn't tell his neighbors about yields and profits. He told them how tall and green his corn grew during a dry season. He knew he made money from fertilizer. This was dramatized to him by the lush, green crop right before his eyes all summer.

It will pay you to take advantage of a farmer's pride in a good crop grown with your fertilizer. He can be an excellent salesman and demonstrator for you. Farm calls, when crops are green and growing, can produce plenty of success stories. The best way to tell these success stories is to take other farmers to see them. This enthusiasm sells fertilizer.

Many farmers, who firmly believe that fertilizer pays, will never bother to measure yields to figure out their actual profits. One way to get them to measure yields is to conduct a contest. Then the chore of measurement becomes important. Getting him to check yields is important to you, because this stresses the benefit, not the price, of fertilizer.

Every good farmer likes to grow good crops. Every good farmer likes to look at good crops. Take advantage of these two powerful urges this summer. It's as good as golf for getting a fertilizer man out into green fields and sunshine. And it probably makes a lot more money!

IN THIS WORLD ... by Gretter
WHEN BUFFALOS ROAMED THE WEST, THE WHOLE PRAIRIE WAS THEIR RANGE...
BUT OUR CATTLE MUST FEED ON THE SAME PASTURE YEAR IN AND YEAR OUT... AND THE GRASSES ARE GROWING THIN FROM INTENSIVE GRAZING!
EROSION CAN BE PREVENTED...
TODAY, A FERTILIZED PASTURE PRODUCES 4 TO 5 TIMES AS MANY POUNDS OF BEEF AS AN UNFERTILIZED PASTURE... WHY? FERTILIZATION GREATLY INCREASES GROWTH AND PROTEIN CONTENT OF GRASS.
FERTILIZER GIVES SOIL THICK, VIGOROUS GRASS COVER... PREVENTS FORMATION OF GULLEYS AND SOIL LOSS BY EROSION.

Here is another Nitrogen Division, Allied Chemical, service to the fertilizer industry. This is one in a series of educational news features now being released to more than 1,000 newspapers reaching more than 5,000,000 subscribers.

NOW is the time to sell PASTURE FERTILIZERS

Livestock farmers are making money today and the biggest net profits are being made where pastures are well fertilized to feed the animals at low cost. These cud-chewing harvesters save lots of labor, and get top feed value out of the lush crops they pick up and stow away.

Pasture improvement is a good market to provide sales and profits for fertilizer men between row-crop rush seasons. Good farmers fertilize pastures several times a year. Right now, in June, after the first spring flush of growth and grazing is gone, is a good time to fertilize pastures to produce green feed for summer. This is true for both permanent pastures and special summer grazing crops.

High-nitrogen mixed fertilizers are the most practical and profitable product to make pastures make money for farmers and fertilizer men. Pastures used to get nothing but a little manure. Then they got some superphosphate. Practical farmers also used straight nitrogen. They tried low-nitrogen mixed fertilizers, and then they found that mixed fertilizers, like 10-10-10, gave even better results. Progressive farmers have been getting exceptional grazing with high-nitrogen fertilizers in the 2-1-1 ratio, either in mixed fertilizer alone, or as mixed fertilizer plus nitrogen top-dressing. It will pay you to promote 2-1-1 ratio fertilizers, and get the entire sale in one bag.

Actually, pasture grass is like corn in its plant food needs. Because corn is actually a grass, you can see how this makes sense. Corn needs 160 pounds of nitrogen, plus 80 to 120 pounds of phosphate and potash per acre to make a 100-bushel crop. Pasture grass can produce just as much feed per acre as corn. But, to do it, pasture grass needs as much plant food as corn. High-nitrogen mixed fertilizer is good corn fertilizer; it is also good pasture fertilizer. You'll make money—and friends—by selling 2-1-1 and 1-1-1 fertilizers for grass.

Corn is the biggest fertilizer user among all crops today. But pastures offer the biggest potential for fertilizer sales. Every section of the country has pastures, and all pastures need fertilizer. There are more acres of pasture and hayland than of any other crop. Some of your customers know it pays well to give pastures plenty of fertilizer. They can help you sell their neighbors. Pasture tours this summer can fill your dealers' stores with customers in the off season. Here are some typical results, telling the story of pasture profits with high-nitrogen mixed fertilizer—

"**Native pasture with no lime or fertilizer produced the feed equivalent of 1,000 pounds of grain per acre. With lime and fertilizer, an acre of pasture produced the equivalent of 2,400 pounds of grain.**"

"Grass, with 250 pounds of 12-12-12 per acre, produced beef gains at a cost of 7 cents per pound. With the equivalent of 150 pounds of 18-12-12 per acre, this grass produced beef at a cost of 5½ cents per pound."

"**Mixed pasture, fertilized with plenty of nitrogen, phosphorus and potash, gave high-producing cows everything they needed for top milk flow. One cow produced 4,600 pounds of milk in 84 days on this pasture alone, without losing weight.**"

"Plenty of 1-1-1 ratio fertilizer (500 pounds of 12-12-12 per acre) more than doubled pasture yields, with dry weight recorded at 3 tons per acre. Fertilizer averaged $18 per acre, and profit, over fertilizer cost, $63 per acre."

"Heavily-fertilized grass, getting 400 pounds of nitrogen in a 4-1-1 ratio fertilizer, produced 8,900 pounds of dry weight feed per acre, containing 1,790 pounds of protein. The grass averaged more than 20% protein."

Technical Tips

PROPERTIES OF SUPERPHOSPHATE THAT INFLUENCE AMMONIATION

The properties of superphosphate which have an important influence on ammoniation are: particle size, free acid content, water content, and porosity.

Small particle sizes will absorb more ammonia than large particle sizes. When the particles of superphosphate are irregular in size, the larger sizes may absorb only half as much ammonia as the smaller sizes. Under plant conditions, ammonia may penetrate to the center of particles no larger than 40-mesh, but at 30-mesh and larger there is much less ammonia take-up.

Ammonia take-up is also reduced when agglomeration of all ingredients has begun before all the ammonia has been added. Ammoniation cannot occur when the superphosphate is imbedded so deeply in the pellet that it is beyond the reach of the ammonia.

In most superphosphates, the influence of free acid on ammoniation can be accurately calculated. 20% superphosphate with a high acid content will absorb about 0.6 pound more ammonia per unit of P_2O_5 than superphosphate with a low acid content will absorb.

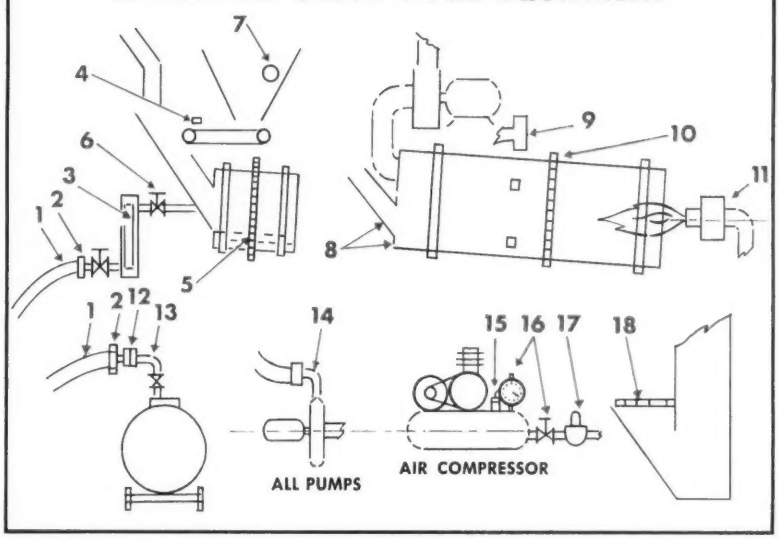
The amount of water in superphosphate or in the total mixture has some direct influence on ammoniation. Indirectly, it can have an important influence. The velocity of absorption of ammonia drops off if the moisture content of superphosphate is below about 40%. On the other hand, excessive moisture in the mixture may result in premature granulation or agglomeration, thereby retarding absorption of ammonia.

The long-held ammoniation rate of 3 pounds of ammonia per unit of P_2O_5 in 20% superphosphate was low because of equipment and techniques and not because of properties of superphosphates. Ammoniation rates were more than doubled when simple changes were made to permit uniform mixing of the ammoniating medium as it enters the mass and also to provide for reacting the ammonia gas that is generated as the temperature of the mass increases.

One unit of P_2O_5 in 20% superphosphate has been made to readily accommodate 5½ to 6½ pounds of free ammonia, without the aid of acid or the loss of nitrogen. Much good fertilizer is being made with ARCADIAN® Nitrogen Solutions supplying 1 unit of nitrogen for each 2 units of P_2O_5.

Triple superphosphates have shown an ability to absorb from 50 to 60% as much ammonia per unit of P_2O_5 as does 20% super, or from 3.5 to possibly 4.0 pounds of ammonia per unit of P_2O_5.

IT PAYS TO CHECK YOUR EQUIPMENT



Here are some of the points to check to insure efficient operation and safeguard men and machinery:

CHECK NOW Repairs	OK		
☐	☐	1	Hose and pipe for wear or corrosion. Note condition of supports.
☐	☐	2	Hose and pipe connections. Are they secure? Are they stainless steel?
☐	☐	3	Condition of float in rotometers.
☐	☐	4	Accuracy of all weighing equipment including rotometers.
☐	☐	5	Distributor pipes for corrosion and wear.
☐	☐	6	Valves for leakage on lines handling solutions and acids.
☐	☐	7	Material bin indicator.
☐	☐	8	Drying, cooling and ventilating equipment for air leaks, corrosion and dust accumulation.
☐	☐	9	Beaters on driers, mixers and other equipment for excessive wear.
☐	☐	10	Condition of guards on belts, chains, gears and all moving parts.
☐	☐	11	Burner unit and controls on dryer equipment for leaks and proper adjustment.
☐	☐	12	Unloading hose connections. Especially note conditions of threads.
☐	☐	13	Hose kinks. Use elbows to eliminate connections where hose kinks might appear.
☐	☐	14	Hose pressure. Test hose for at least double normal working pressure.
☐	☐	15	Air receiver. Drain and make sure filter is given adequate maintenance.
☐	☐	16	Air receiver, safety valve, pressure gauge and shut-off valve for corrosion and operating condition. Replace if necessary.
☐	☐	17	Pressure regulator. Be sure it is operating properly.
☐	☐	18	Condition of grill over pits. Also check ladders and stairways.

HERE'S THE BIG LINE OF Arcadian® NITROGEN SOLUTIONS

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60° F	Approx. Vap. Press. at 104° F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	26
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.188	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.052	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6	42.0	19.5	66.3	6.0	8.2	9.3	1.178	10	34
10	44.4	24.5	56.0	10.0	9.5	11.0	1.108	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.081	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.925	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.972	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	—

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Chemicals

135—THIODAN INSECTICIDE

Thiodan is described by its manufacturer, Niagara Chemical Div., Food Machinery & Chemical Corp., as a broad spectrum insecticide, particularly effective as an aphicide. Chemically hexachlorohexahydro-methano-2,4,3-benzodioxathiepin oxide, Thiodane has proved very effective in controlling insects on potatoes, shade tobacco and seed alfalfa, Niagara says. For more information on the chemical,

CIRCLE 135 ON SERVICE CARD

136—METHOCEL HANDBOOK

A colorful new handbook on Methocel giving technical information and use data has been published by The Dow Chemical Co. Methocel is Dow's trademark for a family of methylcellulose ethers. These synthetic water-soluble gums have found a broad use in a number of industries for thickeners, emulsifiers, emulsion stabilizers, suspending agents and binders, Dow reports. The 60-page handbook presents physical properties of Methocel, describes its chemical composition, preparation of solutions, effect of additives, gelation of solutions and its use in agriculture, chemical specialties and other areas. For your free copy,

CIRCLE 136 ON SERVICE CARD

137—PROCESSING DATA

Floridin Co. has a new bulletin containing specifications and processing information. Three grades of its fuller's earth are widely used by formulators, Floridin reports—Diluex A, finely ground, highly adsorptive degritted material; Diluex, not as finely ground; and Florex, in standard meshes. For your copy of the company's bulletin,

CIRCLE 137 ON SERVICE CARD

138—PENCO KRYOCIDE 96

A technical bulletin on Penco Kryocide 96 has been prepared by Pennsalt of Washington Div., Pennsalt Chemicals Corp. Advantages and uses of the insecticide as a field strength dust, wettable powder, dust and wettable powder concentrate are stated. For your copy of the bulletin,

CIRCLE 138 ON SERVICE CARD

139—NEW STABILIZER AND DISPERSANT

Samples and technical information on Alcogum AN-25 polyelectrolyte are available from Alco Oil & Chemical Corp. The material is said to combine the highly desirable properties of deflocculation and colloidal protection for dispersions of dry powders. Supplied as a water solution, it stabilizes dispersions and emulsions against settling or caking during storage and in certain applications improves spreading characteristics, reports Alco. For technical data and samples,

CIRCLE 139 ON SERVICE CARD

Process Equipt.

140—LIQUID FERTILIZER CENTRIFUGAL PUMPS

Specially designed to handle liquid fertilizer, Deming Co.'s new self-priming, portable, gasoline-engine driven centrifugal pump is described in a bulletin from the company. Data on the engine, pump shaft, support head, liquid end, stuffing box, impeller, diffuser and shaft slinger are included, as well as dimensions and performance curves. The bulletin is yours if you

CIRCLE 140 ON SERVICE CARD

141—FLOOR-ABOVE HAMMER MILL SCREEN CHANGER

Just published by Schutte Pulverizer Co., Inc., new illustrated Bulletin HW 458 introduces a device for changing hammer mill screens instantly from the floor above. By means of extension handles, any one of five selected screens up to ½" thick can be inserted or removed while the mill is running. Claimed to be fool-proof and trouble-free, the Floor-Above Screen Changer is available for all standard Series 10 Schutte hammer mills. For your copy of the bulletin containing specifications and information on the hammer mills and remote control device,

CIRCLE 141 ON SERVICE CARD

142—B-G BELT FEEDER

Designed for any application where a high degree of accuracy is necessary in feeding, such as fertilizers and chemicals, the F-8 belt feeder offers a capacity range from 5 to 550 tph, according to Barber-Greene. Exceptionally low head room permits easy mounting of the F-8 beneath bins or in reclaiming tunnels, Barber-Greene continues. Further information on the F-8 is available. Just

CIRCLE 142 ON SERVICE CARD

143—NICKEL COATED VALVES

A new line of nickel-coated Rockwell-Nordstrom lubricated plug valves has been introduced by Rockwell Manufacturing Co. The company reports they have the same qualities of corrosion resistance as higher-cost solid nickel or stainless steel valves, and have improved mechanical and physical properties. For more information on the line,

CIRCLE 143 ON SERVICE CARD

144—RADIATION SHIELD

Baird-Atomic, Inc. is manufacturing a newly designed low background shield composed of four separate stacked sections to form various complete units for thin-window flow counting, geiger and scintillation counting. With this "building block" construction, the shield provides a minimum of three inches of iron shielding in all directions, Baird-Atomic reports. The shield is designed to hold the company's Model 821B geiger or proportional flow counter or the Model 822A sample holder with geiger tube. For complete details and specifications,

CIRCLE 144 ON SERVICE CARD

145—VIBRATING FEEDER

A wide range of bulk materials can be fed at a uniform rate from bins, hoppers or other containers with the MC motorized counterweight vibrating feeder, reports its manufacturer, Link-Belt Co. It evens out surge loads and results in cleaner installations with considerably less maintenance, the company claims. For a copy of the bulletin which includes dimensions and specifications,

CIRCLE 145 ON SERVICE CARD

How to use the

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146—CANNED MOTOR PUMPS

Features and specifications of its line of pumps for general process pumping are detailed in a revised four-page bulletin from Chempump Corp. Included are performance curves for pumps up to 15 hp, dimensions, principles of construction and operation, cutaway views, materials available, power requirements and other descriptive material. The manufacturer says its Series C Chempumps offer leak-proof pumping of corrosive, toxic, radioactive and other problem fluids at heads of 275 feet and capacities to 600 gpm. Copies of the bulletin are available.

CIRCLE 146 ON SERVICE CARD

147—PREBLENDER-AMMONIATOR-GRANULATOR

An illustrated cutaway drawing and discussion of the Preblender-Ammoniator-Granulator are available from Fertilizer Engineering and Equipment Co., Inc. FEECO says that "this new approach to premixing of all materials before ammoniation yields quality product and reduces formation of chloride fumes." Literature is yours by

CIRCLING 147 ON SERVICE CARD

Materials Handling

148—TRACTOR SHOVEL & ATTACHMENTS

A new eight-page catalog from Allis-Chalmers covers the design, engineering, construction and operating features of the HD-6G tractor shovel. Also included are the HD-6G's specifications and a list of the interchangeable attachments that are available to increase the tractor shovel's versatility. A copy will be sent to you if you

CIRCLE 148 ON SERVICE CARD

149—BAGGING SCALE BULLETIN

Availability of a new six page, two-color bulletin describing and illustrating its E-50 automatic bagging scale has been announced by Ri hardson Scale Co. With four photographs and six cut-away line drawings, the bulletin details the E-50's design, capacities, gravity or power feed operation and discharge. In addition, the bulletin contains engineering drawings, illustrations of suggested feeding arrangements and descriptions of accessories. For a copy,

CIRCLE 149 ON SERVICE CARD

150—L-S OFFERS FREE COPIES OF MAGAZINE

Free copies of the Spring Issue of the *Lewis-Shepard Lever*, a 16-page magazine with articles describing how materials handling problems have been solved in various industries are now available from Lewis-Shepard Products, Inc. Featured in the two-color presentation is a three-page, fully illustrated article on the materials handling operation at a split-level warehouse. For your copy of the issue,

CIRCLE 150 ON SERVICE CARD

151—FOUR-DIRECTIONAL FORK TRUCK

Raymond Corp. has a new fork truck it designates "four-directional" because it can travel forward, backward, sideways to the right and sideways to the left in addition to having conventional lifting features. Loads 14 feet or longer can be handled in aisles as narrow as 7 feet, the company reports. This design is available on the company's outrigger base fork models or on its reach fork trucks. Capacities range up to 4000# on the outrigger trucks and 3000# on the reach. For free literature describing this new unit,

CIRCLE 151 ON SERVICE CARD

152—PNEUMATIC CONVEYOR SYSTEMS

The applications of pneumatic conveying systems designed for handling dry bulk materials are covered in a new 16 page technical bulletin now being offered by Fuller Co. Twenty-seven photos show various stages of operation, including hopper-car unloading stations, rotary valves, portable, stationary and sanitary pumps, loading bulk tanks and batching plants. Line drawings detail construction and operation through cutaway views of hoppers, pumps and silos and explain the pneumatic conveying system's applications. For your free copy,

CIRCLE 152 ON SERVICE CARD

153—TERRALOAD'R BULLETIN

A 12-page three color catalog from J. I. Case Co. features the company's new 4-wheel drive, rear-wheel power-stees tractor shovel. Complete specificationr and illustrations of job applications are included. The catalog shows interchangeable buckets from 1¼ cu. yd. to 2¾ cu. yd. for digging or handling materials. To obtain a copy,

CIRCLE 153 ON SERVICE CARD

Packaging

154—EFFICIENT LIQUID SHIPPING

A new packaging approach for shipping liquids in a polyethylene bottle and corrugated box is covered in detail in a technical report just released by Hinde & Dauch. Among the advantages claimed for this method are reduction of shipping costs through lighter weight, easier handling, elimination of breakage and saving on set-up costs. Among the liquid products which the report says can be shipped in polyethylene are aqua ammonia (which may require venting), copper sulfate solutions, oil in water base emulsions and phosphoric acid. For your copy of the report

CIRCLE 154 ON SERVICE CARD

Miscellaneous

155—PLASTIC LAB WARE

A catalog of Plastic Laboratory Ware is available from Builders Sheet Metal Works, Inc. Containing 20 pages, the booklet pictures, describes and quotes prices for plastic laboratory equipment. Also included is a chemical resistance chart. To secure a copy

CIRCLE 155 ON SERVICE CARD

156—INDICATORS FOR DIRECT OBSERVATION OF FLOW

A new bulletin, just prepared by Schutte and Koerting Co., describes the company's line of flow indicators for pipeline installation to give positive visual indication of flow conditions. The indicators are applicable to liquids and gases, as well as vapors and slurries sufficiently translucent for observation of the indicating components through sight windows. A visual check is possible on flow, flow direction and fluid condition. Three flow indicator types are described in the bulletin—flapper, rotary (paddle wheel) and ball. Copies can be obtained by

CIRCLING 156 ON SERVICE CARD

157—WORK GLOVES FOR INDUSTRY

Coated fabric work gloves made for industry by The Granet Corp. are described in a new booklet from the firm. Photographs, physical properties and data on chemical resistance is included for six types of gloves (Neoprene, Dynagluv vinyl plastic, Granetgrip natural rubber, Dynagrip vinyl plastic-jersey lined, Granecon, and Granflex vinyl plastic-interlock fabric lining). For your copy,

CIRCLE 157 ON SERVICE CARD

See page 57 for information on these Reader Service Numbers:

158—Electric Fork Trucks **159—Portable Bag Closer**

160—Bridge Breaker

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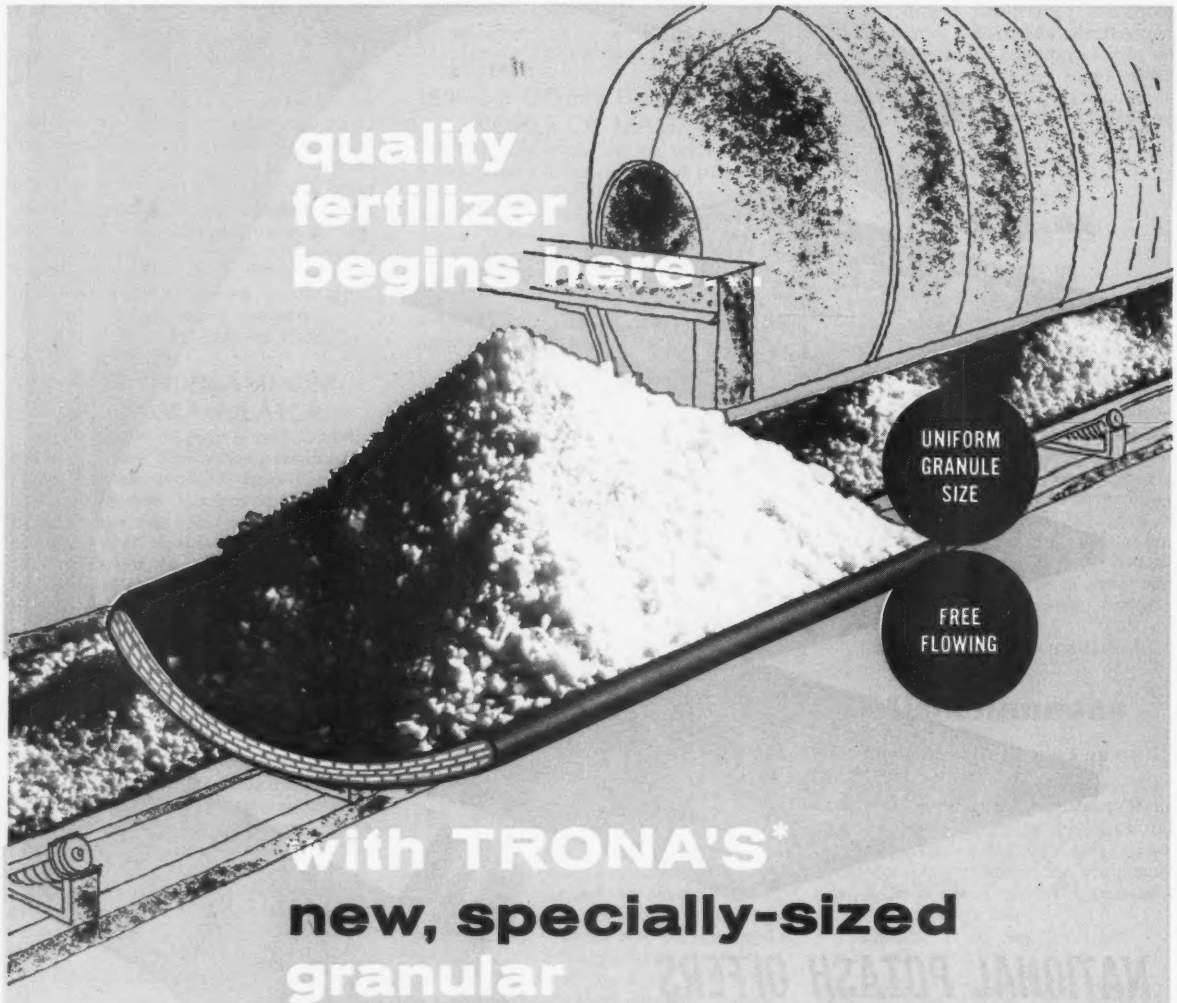

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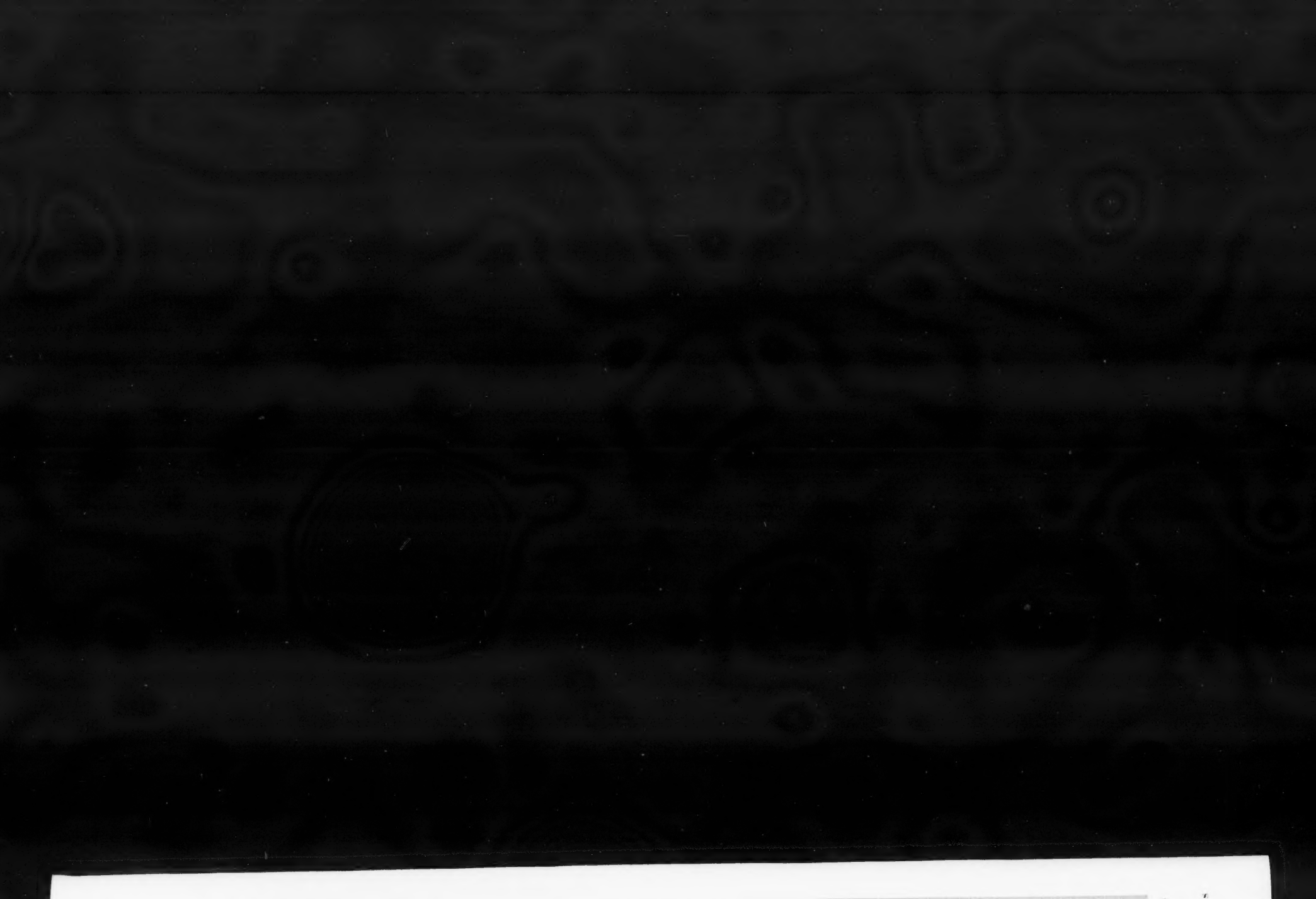

The nitrogen lost annually in ammoniation and granulation is estimated to be worth 2.6 million dollars. Plant-scale studies will help lead the way to

Better NITROGEN Recovery

BY T. P. HIGNETT

MANY manufacturers report serious losses of nitrogen in production of high-nitrogen grades such as 10–10–10 and 12–12–12. A frequent cause of loss of nitrogen is poor absorption of ammonia. Other possible causes include formation of ammonium chloride fume and the decomposition of ammonium nitrate or urea; losses as fume or through decomposition may occur in the ammoniator, in the dryer or, possibly, in the storage pile.

To obtain some idea of the seriousness of the nitrogen loss problem, reports showing analyses of fertilizer samples by state laboratories were studied. Average analyses were calculated for four grades: 10–10–10, 12–12–12, 4–16–16, and 5–20–20. Seven states had analyzed at least 15 samples of each of the four grades. These states were Illinois, Indiana, Kentucky, Minnesota, Missouri, Ohio, and Wisconsin. The average analyses of each of the four grades for the seven states are tabulated below.

Grade	Number of samples	Analysis, Per Cent		
		N	Available P_2O_5	K_2O
4-16-16	1228	4.3	16.3	16.3
5-20-20	1333	5.2	20.1	20.1
10-10-10	1088	9.8	10.8	10.8
12-12-12	1559	11.7	13.0	12.4

The analyses of 1–4–4 grades show no indication of nitrogen loss. The average overrun on each ingredient is 0.2 unit. However, the data show that the 1–1–1 grades contain 1 full unit less nitrogen than the average of their P_2O_5 and K_2 contents. Assuming that they were formulated to have the same weight of the three nutrients, 8 to 10 per cent of the nitrogen has been lost.

The state reports were examined to determine whether high-nitrogen losses were characteristic of any particular type of equipment. No such indication was found. Some plants using each type of ammoniation equipment usually produced ongrade products, but most of the plants had frequent nitrogen deficiences in the 1–1–1 grades. It is estimated that the yearly production of high-nitrogen grades may be about 2 million tons; loss of an average of 1 unit of nitrogen per ton would amount to 20,000 tons of nitrogen per year. At $130 per ton of nitrogen, a typical delivered price for nitrogen solutions, the value of the lost nitrogen would be $2,600,000. This indicates that the problem of nitrogen loss in 1–1–1 grades is widespread and serious.

T. P. Hignett is chief of the development branch, division of chemical development, Tennessee Valley Authority.

Nitrogen Loss and The Law

In addition to the economic loss of nitrogen, a high percentage of the 1–1–1 grades were deficient in nitrogen to an extent that exceeded the tolerance provided by state laws. In some states as many as half of the samples of 10–10–10 and 12–12–12 were deficient to this extent. These deficiencies result in unfavorable publicity and economic loss due to penalties or fines assessed. A further economic loss to the manufacturer is involved in the high overruns in phosphate and potash.

It is my purpose to present data and offer suggestions that may be helpful in improving recovery of nitrogen in granulation plants. Although heavy nitrogen losses also occur in some plants that do not granulate, the 10–10–10 and 12–12–12 grades are usually produced in granular form. I will deal mainly with nitrogen losses in the form of free ammonia gas escaping from the ammoniator. Although loss of ammonia as such is not necessarily the principal source of nitrogen loss, the conditions that are conducive to good ammonia absorption will also minimize fume and decomposition losses insofar as these losses occur in the ammoniator. The discussion will relate specifically to the TVA-type ammoniator, although the principles involved may apply to other types.

The factors that influence ammoniation efficiencies in absence of granulation have been studied by sev-

THE AUTHOR (right) and Dr. Vincent Sauchelli discuss the problem of nitrogen losses, at the TVA pilot plant.

eral investigators and are well known. They include the degree of ammoniation, retention time in the ammoniator, effective mixing, and the moisture content, porosity, and particle size of the superphosphate. Most of these factors are important in preventing high losses of ammonia in granulation plants. However, experience with the TVA pilot plant, plus a good many conversations with fertilizer manufacturers indicate that the cause of high-nitrogen losses is not entirely and perhaps not primarily neglect of well-recognized ammoniation principles.

The problems involved in obtaining good recovery of ammonia in a modern granulation plant are quite different from those involved in producing nongranular fertilizer in a typical batch ammoniation process. In most granulation plants, ammoniation and granulation take place simultaneously in the ammoniator. The operator must adjust moisture and temperature conditions to obtain at least incipient granulation in the ammoniator. These conditions are not always favorable for good absorption of ammonia. However, data from the TVA pilot plant and from some large-scale plants show that good granulation and efficient ammonia absorption can be obtained without appreciably sacrificing either.

Design of Large-Scale Ammoniators

The design of the ammoniator may have an important effect on nitrogen loss. Although the information obtained in the TVA ammoniation-granulation pilot plant is fairly extensive, there is no satisfactory formula for scaling up the pilot-plant data to large-scale design. One method that has been used by industry is to increase all dimensions of the ammoniator equally to provide the same ratio of volume to capacity. However, in our opinion, this method seldom is satisfactory. The pilot-plant ammoniator is 3 feet in diameter by 3 feet long. It operates satisfactorily on most grades at a capacity of about 3 tons per hour. A unit 6 feet in diameter by 6 feet long would have eight times the volume of the pilot-plant unit. It might be assumed that the 6- by 6-foot unit would have eight times the capacity of the pilot plant, or 24 tons per hour. This is not necessarily true. The ammonia and acid distributors of the large unit would be only twice as long as those in the pilot plant, but they would supply eight times as much solution and acid. Each 1-foot length of distributor in the large unit would supply four times the volume of liquids as each 1-foot length in the pilot plant. The large amount of liquids is likely to cause localized excessive temperatures and muddiness and resultant fuming and poor ammonia absorption.

If design of the ammoniator on the volume basis is not satisfactory, then how should it be designed? Is it necessary to increase the length in proportion to the capacity? To do so would make the length 24 feet for a 24-ton-per-hour unit. Increased diameter is needed to handle the larger volume of materials, and some increase in ammoniation capacity should result from the larger diameter. There is no clear answer to this problem. In absence of any better answer, it is suggested that in the design of large-scale ammoniators a capacity of 2 to 2.5 tons per hour per foot of length may be appropriate.

Obviously, the efficiency of an ammoniator depends on a good many factors other than its dimensions. The design and arrangement of the distributors is one of the important factors. Generally, efficient ammoniation will be served best by placing the ammonia distributor in an active portion of the bed and making each inch of the length of the ammoniator do its share of the job. Rate of rotation, bed depth, direction of liquid injection, and spacing of openings in the distributor may be important

The author says that data from the TVA continuous ammoniator-granulator (right) as well as from some large-scale plants show that good granulation and efficient ammonia absorption are possible without appreciably sacrificing either. He explains above why there is "no satisfactory formula for scaling up the pilot-plant data to large-scale design."

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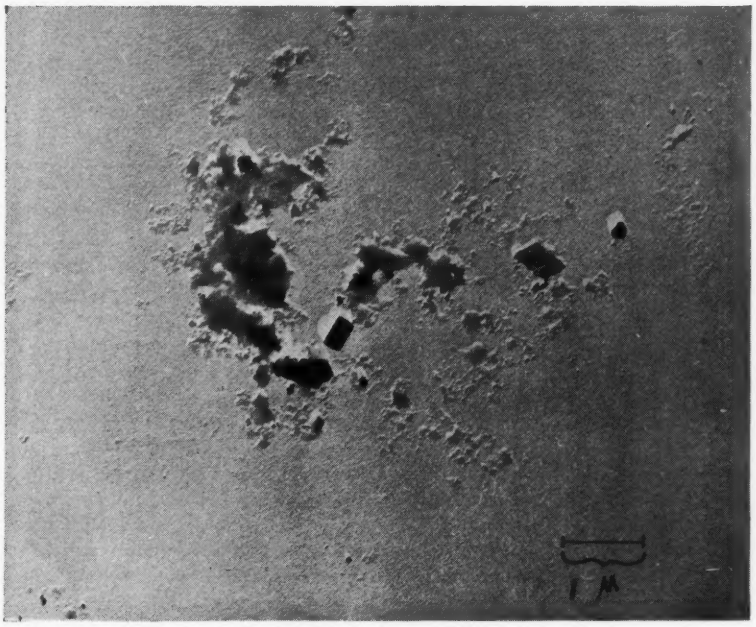

Electronphotomicrograph, TAKO

Magnification 4 (Negative, 5100 diameters; print, 15,000 diameters). On the print, 1mm corresponds to 0.067 microns. Distinct rectangular forms are observed in the range from 0.07 to 0.4 microns in length. Less definite evidence is seen for particles of still smaller size.

pH Value 4.4
Bulk Density—lbs. cu. ft.
Loose—Approx. 20 lbs.
Packed— " 41 "
Porosity 130%
Specific Surface—(CM^2-22,700)
Particle Type—Crystal Flat Rectangular Plates and Crystal Aggregates
Specific Gravity—2.62
Particle Size Distribution—Sedimentation, using Andraesen Pipette Procedure

SIZE (Microns)	EQUAL or FINER %	GROUP %
.5		54.0
.5	54.0	
1.0	64.0	10.0
2.0	75.6	11.6
3.0	81.9	6.3
4.0	85.5	3.6
5.0	87.6	2.1
6.0	89.9	2.3
7.0	91.8	1.9
8.0	92.7	0.9
9.0	93.8	1.1
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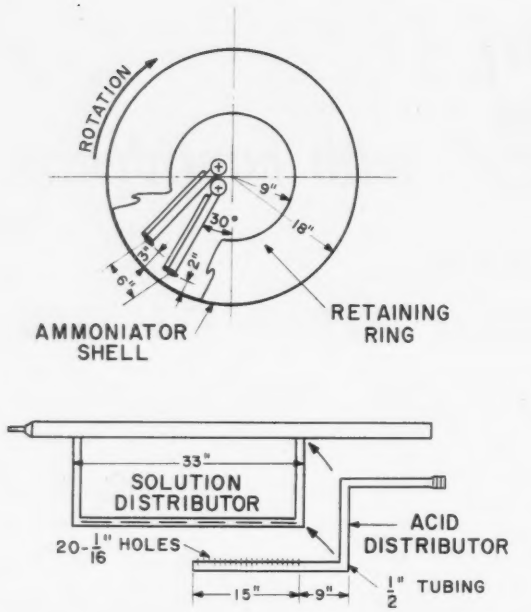
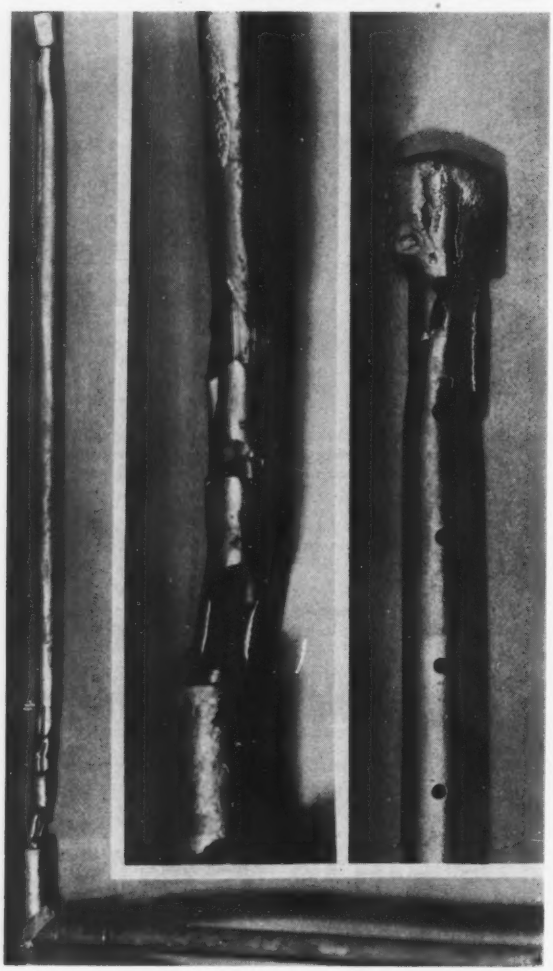


FIGURE 1. Two sets of acid distributors were tried in the pilot-plant ammoniator during runs in which the production of 12–12–12 was studied. The arrangement of the two distributors in the ammoniator is shown above. BELOW. What corrosion can do to distributors.



factors although they did not appear to be critical within the range studied in the pilot plant.

Acid Distributor Location

Further work might profitably be done on the location of the acid distributor. The first method of acid addition in the TVA pilot plant was to spray it on top of the bed. This method was satisfactory when phosphoric acid was used, but when sulfuric acid was top-sprayed, heavy fuming resulted. A drilled-pipe acid distributor 15 inches long (about half the length of the ammonia distributor) was then located under the bed adjacent to the ammonia distributor in the discharge end of the ammoniator. This arrangement caused high ammonia losses. The distributor was then moved to the middle section of the bed. Results with this arrangement were satisfactory. However, this arrangement may not be the best. Particularly in a large-scale ammoniator where larger quantities of acid are injected, it would seem advisable to make the acid distributor fully as long as the ammonia distributor. Recently a full-length distributor for sulfuric acid was tried in the pilot plant with good results.

Some large-scale ammoniators may be so short in relation to the desired capacity that even with a full-length set of distributors the concentration of reaction heat is too great for efficient ammonia absorption. In such cases it may be profitable to install a second set of distributors to utilize the volume of the ammoniator more effectively.

Two sets of distributors were tried in the pilot-plant ammoniator during runs in which the production of 12–12–12 was studied. The arrangement of the two distributors in the ammoniator is shown in Figure 1. The results with dual distributors were quite favorable; granulation was good, and the ammonia loss was very low even with a degree of ammoniation 15 per cent higher than normal (4.5 and 6.5 lb./unit of P_2O_5 from triple and ordinary superphosphate). However, the use of dual distributors was not continued in the pilot plant because a single set appeared to be adequate for normal degrees of ammoniation. It is suggested that the use of dual distributors might be helpful in some large-scale plants that are experiencing heavy ammonia losses.

Care of Equipment

The best-designed distributors will not prove satisfactory if they are allowed to become caked or corroded to the extent that they are no longer effective in giving an even distribution pattern. Daily inspection and cleaning and the repair or replacement of distributors have been found to reduce greatly fuming and nitrogen loss. Use of a corrosion-resistant acid distributor is very helpful in preventing enlargement of the holes with consequent discharge of too much acid in localized areas. Hastelloy C has proved to be highly resistant and has been used successfully in many plants. In some plants Hastelloy C distributors for sulfuric acid have been reported to last 3 years; black iron or stainless steel distributors may corrode seriously in a week.

(Continued on page 46)

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VISITORS observe granular product discharging from the pilot plant granulator. The most important factor affecting ammonia loss in the pilot plant seemed to be control of granulation, particularly in 10–10–10 and 12–12–12 grades.

The most important factor affecting ammonia loss in the pilot plant seemed to be control of granulation. This was particularly true of the 10–10–10 and 12–12–12 grades. Overagglomeration or excessive plasticity in the ammoniator usually caused high ammonia loss regardless of the degree of ammoniation or production rate. Overagglomeration increased ammonia loss because ammonia could not readily penetrate into the oversize granules. Excessive plasticity interfered with the rolling action of the bed and caused ammonia loss due to poor mixing. In tests on 12–12–12, ammonia loss was low (1 per cent of the free ammonia) even when the production rate was high (3 to 4 tons/hr.) and when the degree of ammoniation was high (5.5 lb./unit) if granulation in the ammoniator was well controlled. Conversely, ammonia losses were high (6 per cent) when overgranulation occurred even when the production rate was as low as 1 ton per hour and the degree of ammoniation was only 3.9 pounds per unit. The standard degree of ammoniation was 4.8 for this formulation.

The steps that should be taken to control granulation and prevent overgranulation depend on the facilities available and the economic considerations. In plants that are equipped to control the recycle rate, overgranulation may be controlled by increasing the recycle rate. The disadvantage of this method of control is that the net production rate is decreased, which increases the cost per ton of product.

Another means of preventing overgranulation is by changing the formulation to decrease the heat of reaction or the moisture content of the mixture or both. In the more common formulations for 1–1–1 fertilizers, the water input is derived principally from the moisture content of the superphosphate and the water content of the ammoniating solution. Decreasing the water input from either or both of these sources would be helpful.

Experiments were made in the TVA pilot plant on the production of 10–10–10 using a formulation in which all of the nitrogen was derived from solution X (21.7 per cent NH_3, 65.0 per cent NH_4NO_3, and 13.3 per cent H_2O) and all of the phosphorus was derived from ordinary superphosphate. When the superphosphate contained only 2 per cent moisture, granulation was good and loss of ammonia was low. However, when the moisture content of the superphosphate was increased to 8 per cent, overgranulation and heavy fuming occurred, which indicated high loss of nitrogen. It is not usually feasible to obtain superphosphate as dry as 2 per cent, but the water content of the formulation can be reduced by using ammoniating solutions of low water content.

In many cases, overagglomeration may be caused by excessive heat of reaction. One method of overcoming this difficulty is to change the formulation. Decreasing the sulfuric acid input and using a solution of lower free ammonia content (lower ratio of free ammonia to total nitrogen) are often the most economical ways to decrease the heat of reaction. Other methods include formulation with phosphoric acid or diammonium phosphate or use of increased amounts of ammonium sulfate.

Use of too much sulfuric acid probably is a frequent cause of high nitrogen loss. Some operators may feel that, since sulfuric acid helps granulation, using more of it is the answer to any granulation problem. Others may feel that the way to prevent ammonia loss is to add more sulfuric acid. These lines of reasoning often prove fallacious. Very often less nitrogen will be lost when using a moderate amount of sulfuric acid and a high degree of ammoniation than when using more sulfuric acid and a lower degree of ammoniation.

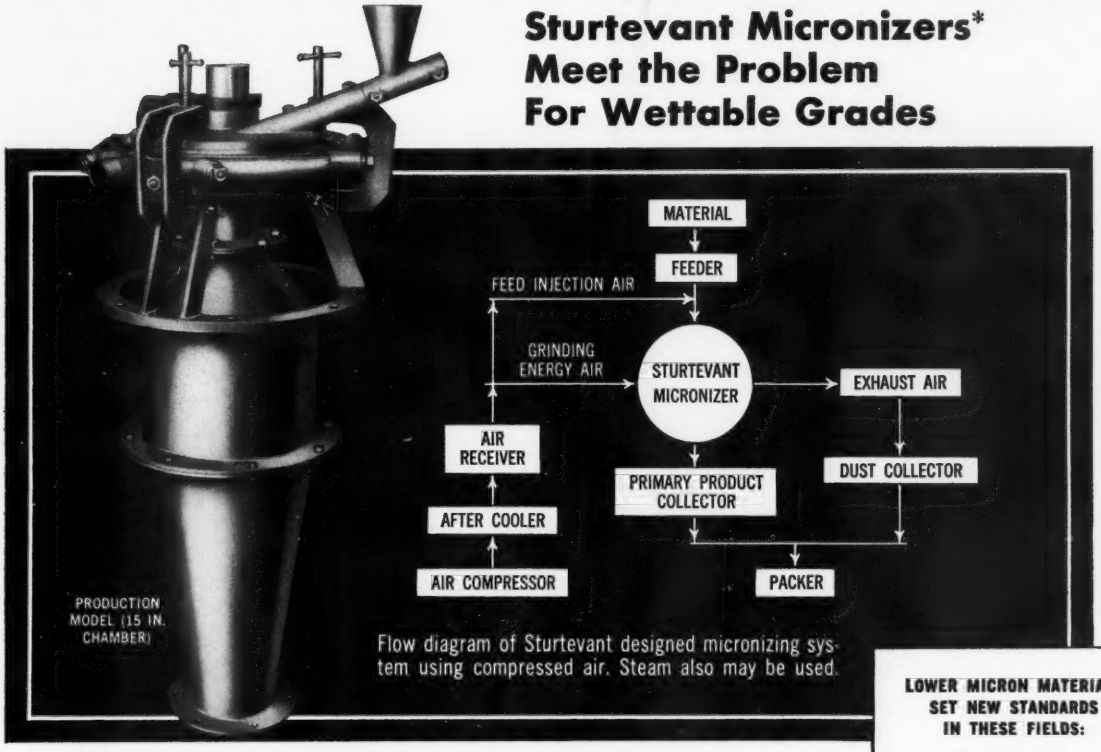
Degree of Ammoniation

As mentioned previously, the degree of ammoniation seemed to have less effect in the pilot plant than the physical conditions in the bed. In the pilot-plant work the standard degrees of ammoniation were 3.8, 5.8, and 7.2 pounds of free ammonia per unit of P_2O_5 from triple superphosphate, ordinary superphosphate, and phosphoric acid, respectively. These values were considered to be conservative; under well-controlled conditions, 10 to 20 per cent higher values were used without excessive loss. Sulfuric acid was assumed to react with the amount of free ammonia required to produce ammonium sulfate.

The degree of ammoniation that can be attained without serious loss in any given plant depends on the equipment, the accuracy of feed rates, and the method of operation. It is suggested that each manufacturer should determine by test what degree of ammoniation he can use economically in his equipment. This may be either more or less than the standard used in the TVA pilot plant. If it is less, it may be profitable in some cases to try to improve the equipment or its operation. In other cases, it may be just as well to reduce the degree of ammoniation to conform to the limitations of the equipment and operating personnel. Usually, the best way to

Insecticides to I.C.A.-W.H.O. Specs.

Sturtevant Micronizers* Meet the Problem For Wettable Grades



Flow diagram of Sturtevant designed micronizing system using compressed air. Steam also may be used.

Particles Grind Each Other, Classifying is Simultaneous; No Attritional Heat

One operation. Sturtevant Micronizers grind and classify in a single fluid-jet chamber — provide fines in range from ½ to 44 microns to meet today's increased product fineness requirements. Because of impact action and cool atmosphere, even heat-sensitive materials can be handled.

No moving parts. Particles in high speed rotation, propelled by compressed air or steam entering shallow grinding chamber at angles to periphery grind each other by violent impact. Design provides for instant accessibility, easy cleaning.

Simultaneous classification. Centrifugal force keeps over-size materials in the grinding zone, cyclone action in central section of chamber classifies and collects fines for bagging. Rate of feed and pressure control particle size of fines.

Can combine other processes. Sturtevant Micronizers can be adapted for coating one material with another and for effecting chemical reactions and changes in physical characteristics, while in process of reducing solids to micron size.

Eight models available. Grinding chambers are in eight sizes, ranging from 2 in. diameter laboratory model (½ to 1 lb. per hr. capacity) to large 36 in. diameter production model (500 to 4000 lbs. per hr. capacity). Send today for fully descriptive literature.

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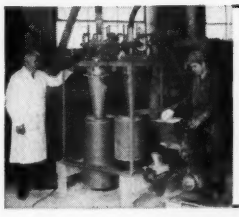
Fluid-Jet Systems For Special Needs

A 30 in. Sturtevant Micronizer is reducing titanium dioxide to particle size under 1 micron at a feed rate of 2250 lbs. per hr. For another firm, a 24 in. model grinds 50% DDT to 3.5 average microns at a solid feed rate of 1200 to 1400 lbs. per hr. A pharmaceutical house is using an 8 in. model to produce procaine-penicillin fines in the 5 to 20 micron range. Iron oxide pigment is being reduced by a 30 in. Micronizer to 2 to 3 average microns at rates of 1000 lbs. per hr. Sturtevant Engineers will help you plan a Fluid-Jet system for your ultra-fine grinding and classifying requirements. *Write today.*



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Laboratory test-micronizing of your own material, or production micronizing on contract basis, are part of Sturtevant service. See for yourself the improvement ultra-fine grinding can contribute to your product. Or, if you have limited requirements for ultra-fine grinding, Sturtevant's contract micronizing service may be the economical answer. Write for full details.

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OPERATOR watches TVA pilot plant ammoniator during tests on nitrogen losses. The conditions that are best for good ammonia absorption also minimize fume and decomposition losses in the ammoniator.

reduce the degree of ammoniation is to use an ammoniating solution containing a lower proportion of free ammonia. This is less expensive than replacing part of the solution with ammonium sulfate or adding more sulfuric acid to reduce the degree of ammoniation. Increased use of sulfuric acid is often ineffective in improving ammonia recovery.

Physical Properties of Superphosphate

Experience in the TVA pilot plant indicated that the physical properties of the superphosphates did not have an appreciable effect on ammonia absorption within the range and under the conditions studied. The moisture content of the ordinary superphosphate used varied from less than 1 to about 7 per cent without any evidence of an effect on ammonia absorption. This was true when the superphosphate was ammoniated with nitrogen solutions with or without granulation provided that the total moisture content was not high enough to cause excessive agglomeration. In these tests, water was supplied as a component of the ammoniating solution and in some cases additional water was supplied to promote granulation.

The particle size of the superphosphate did not have any appreciable effect on ammonia absorption when ammoniation and granulation were carried out simultaneously. In one test, 39 per cent of the superphosphate was in the range of 4 to 28 mesh and 61 per cent was under 28 mesh; in a comparable test, the superphosphate was ground so that all of it would pass a 28-mesh screen. Ammonia absorption was slightly but not significantly better with the unground superphosphate.

In other tests (*1*), granular (6 to 20 mesh) triple superphosphate appeared to absorb ammonia as efficiently as nongranular material. The granular material had a porous structure.

Importance of Moisture

At first glance, the results described above seem contradictory to those reported by Kumagai (*2*) who found that ammonia absorption efficiencies were increased by moisture content of superphosphate and by decrease in its particle size. This apparent discrepancy is readily explained by the fact that Kumagai's experiments involved ammoniation with anhydrous ammonia, without granulation. The moisture in the superphosphate was the only water present, whereas in the TVA experiments, water was also supplied in the ammoniating solution or separately to aid granulation. From a practical viewpoint, in granulation processes the amount of water present must be adjusted to that required for granulation. Therefore, it would seem advantageous to have the basic formulation as dry as possible to provide maximum latitude for control of granulation by addition of water. If the formulation is too dry, it is simple to add water; but if the formulation is too wet, it may be difficult to avoid overgranulation.

Also, in most granulation processes, agglomeration and ammoniation proceed concurrently, so the initial particle size of the superphosphate is not important. The particle size of the agglomerates is important; over-granulation should be avoided because ammonia will not readily penetrate to the center of an oversize granule.

In the TVA pilot plant, commercial superphosphates from several sources were used. No difference in ammoniation efficiencies was noted. However, no tests were made with the very dense, hard triple superphosphate that is produced in some plants; it is likely that such superphosphate could not be ammoniated efficiently.

High-nitrogen losses are a widespread, serious problem in the production of high-nitrogen granular fertilizers. *Plant-scale studies* are needed to overcome this problem since pilot-plant data are not always directly applicable. The following lines of attack are suggested:

1. Be sure that the ammonia and acid distributors are well designed and keep them in a good state of repair.
2. Some experimentation in improving the design or location of distributors is suggested, including lengthening them where feasible or using dual distributors.
3. Overgranulation should be carefully avoided by limiting the amount of sulfuric acid in the formulation, limiting the water content of the formulation, controlling the recycle rate, or other means, depending on the design of the plant.
4. Formulations giving an excessive heat of reaction should be avoided by whatever means are most effective and economical.

References

1. Phillips, A. B.; Young, R. D.; Lewis, J. S., Jr., and Heil, F. G. "Development of a One-Step Process for Production of Granular Triple Superphosphate." Paper presented at the 132nd meeting of the American Chemical Society, September 1957.
2. Kumagai, Rikio; Rapp, Herbert F., and Hardesty, John O. *J. Agr. Food Chem.* 2, 25–30 (1954).

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NEW INSECTICIDE PLANT FOR GENERAL CHEMICAL DIV.

Allied Chemical has completed manufacturing facilities for formulation of emulsifiable insecticides at the Minneapolis plant of its General Chemical Div. Products to be formulated will include DDT, heptachlor, aldrin, dieldrin, endrin, toxaphene and others.

This is the seventh General Chemical location to produce insecticides and basic toxicants.

CHEMICAL SALES UP, SAYS McLAUGHLIN GORMLEY KING

A 67.7 per cent increase in McLaughlin Gormley King Co.'s Chemical Division sales in the first half of the company's fiscal year, Oct. 1, 1957 to March 31, 1958, as compared with the first half of fiscal 1957, has been reported by the company. J. E. Lee, sales manager of the division, said, "This makes 1958 largest first half in company's history." While earnings figures are not yet available, Lee stated that they are expected to show a substantial increase

NEW BOOKLET GIVES ANSWERS ON LICENSING

A new publication available without charge from Pegasus International Corp. answers many questions on foreign licensing.

Foreign Licensing—Questions and Answers is designed to "help the business executive gain a working knowledge of the problems of foreign licensing, and to serve as a guide in avoiding its pitfalls."

In question-and-answer form, the booklet presents the advantages and disadvantages of licensing and goes into such practical problems as selecting the proper partner, the importance of securing patents, setting royalty fees and collecting them in dollars, evaluating potential markets and similar topics.

A copy may be obtained by writing on company letterhead to Pegasus at 1 East 53rd St., New York 22, N. Y.

POTTER NAMED V-C BOARD CHAIRMAN

Justin Potter of Nashville, Tenn., a large V-C stockholder, was elected chairman of the board of Virginia-Carolina Chemical Corp., at a meeting of the board on May 5, the company reports.

Potter's election followed the resignation of William C. Franklin, who had served as board chairman since Sept. 28, 1956.

Franklin nominated Potter as the new chairman and his election was unanimous.

Potter was first named to the V-C board on Oct. 29, 1956. He also is chairman of the board of Cherokee Insurance Co., a director of the Commerce Union Bank and is an executive of *Farm and Ranch* magazine.

HERCULES REPORTS ON RESULTS OF 1st QUARTER

For the three months ended March 31, 1958, Hercules Powder Co. reports earnings on its common stock of 38 cents a share, compared with 48 cents a share for the first quarter of 1957.

Net sales and operating revenues for the quarter were $56,805,235 compared with $60,867,639 for the first quarter of 1957.

DOW NINE MONTHS EARNINGS REPORT

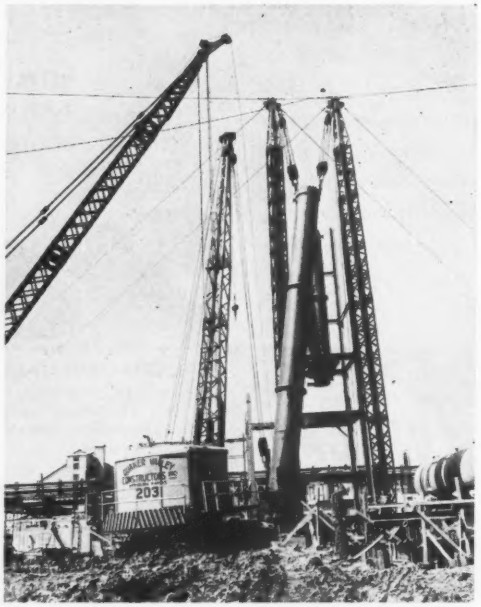
Net income of $36,906,021 or $1.43 per share of common stock outstanding, has been reported by Dow Chemical Co. for the nine months period ended February 28, 1958. Sales for the period totaled $482,044,367.

During the same period of 1957, net income was $39,061,722, amounting to $1.55 per common share, on sales totaling $498,296,106.

Dow's board of directors has declared a dividend of 30 cents per share on common stock, payable July 15, 1958, to stockholders of record at the close of business on June 16, 1958.

SECOND UREA PLANT FOR SPENCER

A reactor to be used in the production of urea at Spencer Chemical Co.'s Henderson Works is shown here being set into position. Construction of the plant, which will have a 100-ton-per-day capacity, is expected to be completed some time this summer. Weighing 85 tons, the reactor shown here has a 5½ inch thick shell designed to withstand the high temperatures and pressures of the urea process. Spencer will produce urea primarily for fertilizer use. It will be marketed both as a solid material in prilled form and as a component in nitrogen solutions. This will be Spencer's second urea facility. The first, a 33-ton-per-day unit at the company's Vicksburg, Miss. Works produces solutions only.



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NEWS FOR THE INDUSTRY. West Virginia's entry into the multiwall bag field brings with it 70 years of paper leadership. The experienced multiwall sales representatives formerly with the businesses acquired have been retained to continue bringing you the best in multiwall bag service.

Four modern manufacturing plants and eight district sales offices will continue to serve you: in the North, under the direction of Sheldon Y. Carnes, Regional Manager, and Tom L. Jones, Regional Sales Manager; and in the South, under the direction of Jason M. Elsas, Regional Manager, and J. Frank Greeley, Regional Sales Manager.

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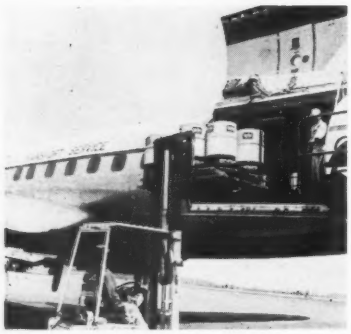
FARM CHEMICALS

Business & Management

ALDRIN FOR IRAQ



Twenty metric tons of aldrin recently were flown by the Military Air Transport Service to Iraq to combat a serious infestation of locusts. Here MATS airmen load the insecticide, an emulsifiable concentrate manufactured by Stauffer Chemical, aboard plane at Dover Air Force Base, Dover, Del. The emergency shipment was arranged by the United States State Department.

DIAMOND ALK. BEGINS NEW SALES & SERVICE PROGRAM

A new, long-term sales and service program has been announced by Loren P. Scoville, general manager of Diamond Alkali Co.'s Chlorinated Products Div., which operates plants at Newark, N. J.; Des Moines, Iowa and Greens Bayou, Tex. Said Scoville, "In this area of our business the company henceforth will concentrate its sales and technical service activities on Diamond 2,4-D and 2,4,5-T and their formulations, BHC, DDT, Lindane, miticide, hexachlorobenzene and grain fumigants."

L. J. Polite, Jr., sales manager of the Chlorinated Products Div., is directing the expanded program, assisted by James O. King, recently appointed manager of agricultural chemical sales. Under the reorganization, regional representatives of the program are Herman E. Meadows, Southwest; Elmer G. Osborne, Southeast; Harold A. Branson, Northeast; Goerge A. Lawrence Jr. and Edward R. Luoma, Midwest; and Bernard D. Clayton, Pacific Coast. Robert J. Orlik, assisting King at Cleveland, will work directly with branch offices at Cleveland, Pittsburgh, Cincinnati and St. Louis in covering West Virginia, Ohio, Kentucky, Missouri and sections of Pennsylvania, New York, Illinois and Virginia.

CYANAMID TO BUILD MALEIC ANHYDRIDE PLANT

American Cyanamid Co. will begin constructing this summer a new, multi-million dollar maleic anhydride manufacturing plant at Bridgeville, Pa., according to W. G. Malcolm, president. Cyanamid reports it is the largest consumer of maleic anhydride in the United States.

Initial rated production capacity will be 14,000,000 pounds annually. Expansion plans are being incorporated in the plant design to facilitate an increase in capacity if and when needed.

LIQUID WAREHOUSING FACILITY AT MEMPHIS

Memphis Mixed Products Terminal Corp. is building a "liquid warehousing facility" on an 11-acre site in Memphis Harbor on President's Island. This is the first time that a tank farm operation has been made available to distributors, manufacturers and shippers on a lease basis, the company reports.

Tanks have already been built for liquid fertilizers and petroleum jelly. Since tank specifications are different for various products, tanks are being constructed as contracts for their use are negotiated.

The facility will be used as an accumulation or distribution point or both. The average tank will accommodate 600,000 gallons of liquid, although larger and smaller tanks will also be built according to manufacturers' requirements, the corporation stated.

AMERICAN CHEMICAL PAINT BECOMES AMCHEM PRODUCTS

Amchem Products, Inc., is the new name for American Chemical Paint Co. Officials of the company said that since the company was started 44 years ago, its activities have been expanded and its products diversified in the chemicals field—whereas it no longer manufactures paint of any kind.

The change of name will not affect in any way capital or corporate structure of the company.

TEXAS GULF SULPHUR CO. RESULTS FOR 1st QUARTER

Net income of Texas Gulf Sulphur Co., Inc. for the three months ended March 31, 1958 was $3,472,487 or 35 cents a share on the 10,020,000 shares in the hands of stockholders.

This compares with net income of $5,630,691 or 56 cents per share on the same number of shares for the first quarter of 1957.

Gross revenue from sales totaled $12,138,178.

TRIPLE BY WATER, RAIL

After a voyage from Tampa, Fla. across the Gulf of Mexico and up the Mississippi and Ohio Rivers a barge carrying Trebo-Phos triple superphosphate from American Cyanamid Co. is loaded onto freight cars at Cincinnati, O. for distribution to Midwest fertilizer manufacturers. Additional bargeloads of the plant food were shipped to St. Louis, Omaha and Minneapolis, the company announced.

FARM CHEMICALS People

American Cyanamid Co. Omar L. Patton has been appointed assistant manager of sales training for the Agricultural Div. He will assist E. F. Loats, manager of sales training. He formerly was a district sales manager located in Ft. Wayne, Ind.

Patton

Chemagro Corp. Kansas City promotions: Dr. James R. Costello to supervisor of Process Development Group; Lawrence W. Berglund to supervisor of the Engineering Group and Robert A. Mohr to supervisor of the pilot plant.

Climax Molybdenum Co. New manager of advertising and promotion is Edward M. Eriksen, who will continue to handle advertising and promotion for the parent company, American Metal Climax, Inc.

Columbia-Southern Chemical Corp. George W. Sadler joins the company as a technical representative for its Boston district sales office.

Davison Chemical Co. Chemical technical service activities have been consolidated under F. Emerson Ivey, Jr., as manager. Formerly in charge of petroleum catalysts technical service, Ivey went to Davison in 1948 from Gulf Oil Corp.

Ivey

R. W. Greeff & Co., Inc. Harry Y. de Schepper and Charles E. Griffith have been elected vice presidents of the company. Both have been with the firm for over 20 years and are also members of

deSchepper

Griffith

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The 1958 Directory is the most up-to-date farm advisor name and address book available.* Here's an opportunity to have an accurate sales promotion list for either direct mail or personal contact work. Find out who the men are that guide your potential customers when they decide to buy. Order your copies of the '58 Directory today.

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FARM CHEMICALS People

Hayes-Sammons Chemical Co. Ralph Martin goes to the company as controller, according to an announcement by Thos. B. Sammons, Jr., president. Previously, Martin was with California Eastern Aviation, Inc. as controller.

Martin

Hooker Electrochemical Co. Dr. John T. Rucker, Jr. has been named manager of analytical and physical chemistry in the Research and Development Dept. Since 1957 he had been administrative assistant to the technical director, Dr. Clarence A. Stiegman.

International Minerals & Chemical Corp. Appointment of Harold W. Hoffman as an agricultural sales representative in the Potash Div. Shreveport, La., district office is announced by the company. He will be responsible for agricultural potash sales in Louisiana, Texas and Southern Mississippi.

Hoffman

Michigan Chemical Corp. Everett E. Klicker is named market research manager to assist H. Stanley Lawton, vice president of sales and development, in extending markets for the company's basic chem cals and their derivatives. Klicker formerly was sales and development manager of the Rare Earths and Thorium Div.

National Aviation Trades Association. Robert E. Monroe of Prescott, Arizona, has joined the Washington staff of NATA as assistant to the executive director, Charles A. Parker. Monroe will give special attention to matters pertaining to agricultural aviation, maintenance and the NATA annual convention.

Naugatuck Chemical Div., United States Rubber Co. Raymond J. Mucci has been named assistant to the general manager of the division. Mucci, who had been a member of the chemical division's Commercial Development Dept., will be engaged in general forecasting and business research assignments.

Nitrogen Div., Allied Chemical Corp. Hugo Riemer has resigned as president of Nitrogen Div. He was connected with Allied Chemical for 22 years.

Nitroform Agricultural Chemical Co. Appointment of Albert J. Puschin as executive vice president has been announced by the company.

Olin Mathieson International Corp. Frank J. Pizzitola has been named general manager, Chemicals Div. Pizzitola, who joined the company in 1956, was formerly an assistant to the vice president in charge of **Pennsalt of Washington Div.,** Pennsalt Chemicals Corp. has added Robert Kennel to the agricultural chemicals sales staff. He will represent the division in New York and adjoining areas, and establish his office at Port Jefferson, New York.

Pizzitola

Spencer Chemical Co. Dr. Nat C. Robertson has been elected vice president in charge of research and development. Newly named director of central research is Dr. O. V. Luke.

Before joining Spencer on Feb. 15, Dr. Robertson was a vice president and director of research for Escambia Chemical Corp. Dr. Luke was formerly manager of plastics research for Celanese Corp. of America.

Stauffer Chemical Co. Iver Macdougall has been elected assistant secretary of the firm. Macdougall joined Stauffer as an administrative assistant in 1953. Prior to that, he was engaged in private law practice in Nashville, Tenn.

The Texas Co. Robert G. Rankin, director of the budget, has been named to succeed Ernest C. Breeding, who retires as comptroller on June 1. W. R. Love, assistant comptroller, succeeds Rankin as director of the budget and J. W. Templeton becomes assistant comptroller.

Robert E. Sattler, former teaching assistant in the Agronomy Dept. of the University of Illinois, has been appointed a sales representative for the Petrochemical Sales Div. He will serve Wisconsin and Minnesota, headquartering in Texaco's Chicago regional sales office.

Velsicol Chemical Corp. At the recent annual stockholders meeting, the following changes in organization were announced: Joseph Regenstein, Jr., previously president, becomes chairman of the board, and E. T. Collinsworth, Jr., former executive vice president, becomes president. John F. Kirk, vice president and director of sales, was appointed to the board of directors.

Virginia-Carolina Chemical Corp. New head of the company's Chemical Div. is Dr. William P. Boyer, director of research and development. He is responsible for the sales, marketing and production activities of the V-C Chemicals Div., and will continue to direct the company's research and development programs.

John A. Watson and Fred G. Dilger have joined V-C as economic cost analyst and manager of the Systems Dept., respectively.

FARM CHEMICALS — Associations & Meetings

AUGUST MEETING SCHEDULED ON FERTILIZER APPLICATION

Purdue University, Lafayette, Ind., will be the site for the August 4 annual meeting of the National Joint Committee on Fertilizer Application, to be held in conjunction with the American Society of Agronomy.

B. A. Krantz, University of California and vice chairman of the NJCFA, will preside.

A panel discussion on "Band Seeding," moderated by George Enfield of USDA, will include comments by M. B. Tesar, Michigan State University; J. L. Parsons, Ohio Agricultural Experiment Station; J. A. Jackobs, University of Illinois and Richard F. Dudley, USDA.

A field trip to fertilizer placement demonstrations and exhibit of fertilizer placement machinery has been planned for the afternoon.

NPFI FINANCIAL GRANTS PROVIDED TEN STATES

Financial grants to nine states to support research projects in developing new information on profitable response to fertilizer use, and a grant to another for tape recorded broadcasts were recently announced by the National Plant Food Institute.

The institute-supported projects include the following:

Indiana. Partial support of a cooperative project between the Agronomy Dept. and Agricultural Economics Dept. Objective is to measure response to fertilizer applications and to evaluate this response in economic terms.

Kentucky. Research is underway on the response of crops to increments of fertilizer: attempting to obtain the upper limits of yield per acre and relating these to economic factors.

Michigan. Arrangements have been made with the Soils Dept. and Economics Dept. to support research work measuring crop response to fertilizer and evaluating the response in economic terms.

Minnesota. Support of demonstration work on pasture fertilization under the direction of C. A. Simkins, Extension soils specialist, and Ermond R. Hartmanns, agricultural economist.

Missouri. Financial grants for demonstration projects where needed and for fertilizer research work in general.

North Carolina. A $2,000 grant for a state-wide series of tape recorded broadcasts on subjects dealing with soil fertility, soil tests, fertilizer placement, liming, economics of fertilization and related material.

Oregon. A $1,000 grant to help support field experiments in the coastal area of Oregon. Purpose is to determine the need for lime and fertilizer in producing forage crops.

Texas. A $1,000 grant to support an outlying fertilizer experimental program as a basis for promoting demonstration tests and improving soil test recommendations in this area.

Washington. A $2,000 grant to the University of Washington to develop specific information on the response of Douglas fir trees to fertilizer applications under field conditions.

Wisconsin. A $1,200 grant to the demonstration program conducted by Professor C. J. Chapman on corn, pasture and small grains.

CALENDAR

June 15-18. National Plant Food Institute, Greenbrier Hotel, White Sulphur Springs, W. Va.
June 18-19. American Grassland Council annual meeting, North Carolina State College, Raleigh.
June 25-27. Pacific Branch, Entomological Society of America, San Diego, Calif.
June 28. Del-Mar-Va Peninsula Fertilizer Assn. annual meeting, Ocean City, Md.
July 8-10. Pacific N. W. Fertilizer Conference, Pocatello, Idaho.
July 13-15. Plant Food Institute of Va. and N. C. meeting, Cavalier Hotel, Raleigh, N. C.
July 18-19. Southwest Fertilizer Conf. and Grade Hearing, Buccaneer Hotel, Galveston, Tex.
July 29-30. Fertilizer Conference sponsored by Ala. Polytechnic Institute Experiment Station: July 29-Black Belt Substation near Marion Junction, Ala.; July 30-Pratville Experiment Field.
July 30. Annual Kentucky Fertilizer Conference, Greenville, Ky.
Aug. 4. National Joint Committee on Fert. Application meeting, held in conjunction with American Society of Agronomy, Purdue University, Lafayette, Ind.
Aug. 20-24. Canada Fertilizer Association annual meeting, Manoir Richelieu, Murray Bay, Que.
Sept. 7-12. American Chemical Society national meeting, Chicago.
Sept. 9-12. National Chemical Exposition, sponsored by Chicago Section, American Chemical Society, International Amphitheatre, Chicago.
Sept. 15-19. Instrument-Automation Conference and Exhibit, Philadelphia, Pa.
Oct. 14-15. Western Agricultural Chemicals Assn. annual meeting, Villa Hotel, San Mateo, Calif.
Oct. 20. Sales clinic of Salesmen's Association of the American Chemical Industry, Roosevelt Hotel, New York City.
Oct. 20-21. Fertilizer Section, National Safety Council annual fall meeting, LaSalle Hotel, Chicago.
Oct. 22-24. Pacific N. W. Plant Food Assn. annual meeting, Gearhart, Ore.
Oct. 28. Assn. of Consulting Chemists & Chemical Engineers annual meeting, Biltmore Hotel, New York City.
Oct. 28-29. Northwest Garden Supply Trade Show, Masonic Temple, Portland, Ore.
Oct. 29-31. 25th annual meeting National Agricultural Chemicals Assn., Bon Air Hotel, Augusta, Ga.
Nov. 9-11. Calif. Fertilizer Association 35th annual convention, Ambassador Hotel, Los Angeles.
Nov. 24-25. Eastern Branch, Entomological Society of America annual meeting, Lord Baltimore Hotel, Baltimore, Md.

FARM CHEMICALS — Government

RADIATION MAY CONTROL GYPSY MOTH, OTHER PESTS

Mass sterilization of insects by gamma radiation may some day help to control forest insect pests. Radiation research to check insect infestations is being conducted by the Northeastern Forest Experiment Station of the U. S. Forest Service.

Life cycles and mating habits of some insects may be such that sterilization of males will never control insect populations. But tests are now under way on the white-pine weevil and the gypsy moth that may bring long-sought controls.

At the Brookhaven National Laboratory on Long Island, male and female gypsy moth pupae were exposed to gamma radiation. Adults emerging from the irradiated pupae were mated. The proportion of sterile offspring is now being determined.

When all the laboratory test results have been evaluated, it may be that the gypsy moth and weevil can be controlled in the field by releasing sterile males. These males will mate, but females will not produce fertile eggs. Thus, if enough sterile males can be freed, insect populations may in time decrease.

Incentive for this experimentation was given to Forest Service entomologists by the work of the Agricultural Research Service. Sterilization by irradiation under ARS supervision resulted in eradication of the screw-worm, an insect that attacks cattle, on the island of Curacao in the West Indies. Within three months after the release of the sterile males, the screw-worm was eradicated on the island.

CALIF. FRUIT FLY TRAPPING PROGRAM

Mexican fruit fly and multiple-purpose fruit fly traps will again be maintained for a five month period, from June 1 to October 31, in California, according to W. C. Jacobsen, director of the California Department of Agriculture.

ICA AUTHORIZATIONS

Korea. $200,000—agricultural pesticides (PA 89-236-99-LI-8017). Contract period: April 28 to Sept. 30, 1958. Source: World wide. Terminal delivery date: Dec. 31, 1958. Barter provision applies.

Turkey. $50,000—pesticides (PA 77-236-99-LI-8004). Contract period: April 30 to Sept. 30, 1958. Source: World wide. Terminal delivery date: Dec. 31.

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FARM CHEMICALS — Equipment & Supplies

CONTINENTAL F-STYLE CANS HAVE STACKING FEATURE

Continental Can Company has announced it is now manufacturing F-style cans in half pint, pint and quart sizes that stack securely, making possible a multiple display of an item within a small area.

The new half pint can's bottom is indented so that the centrally located ¾-inch nozzle at the top of one can fits snugly into another.

NEW LINE OF CLARKLIFT ELECTRIC FORK TRUCKS

An entirely new line of electric powered fork trucks, in addition to its line of gas-powered fork trucks, has been announced by the Industrial Truck Div. of Clark Equipment Co. Major components of electric and gas models of similar capacities are interchangeable.

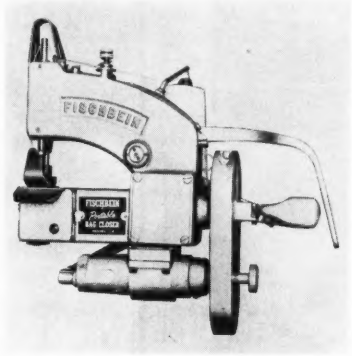
The first model of the Clarklift Electric line, of 2,000 lbs. capacity, is now in production. Additional models of heavier capacity are being scheduled.

A new type of "carbon pile" drive control, says Clark, provides constantly smooth acceleration from a standstill to full maximum speed and permits full control of "inching" during delicate stacking operations. The 2,000 lb. model has a turning radius of 62 inches, a length of 67¼ inches, a width of 34½ inches and a 44 inch wheelbase.

Complete information may be obtained by

CIRCLING 158 ON SERVICE CARD

PORTABLE BAG CLOSER WITH NON-ELECTRIC MOTOR



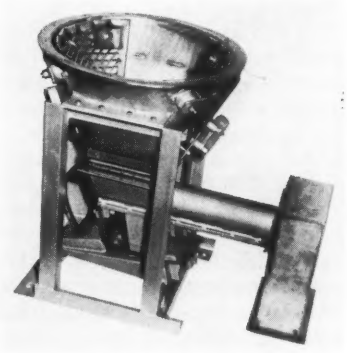
Introduction of a new portable bag closer which is driven by a non-electric air motor has been announced by the Dave Fischbein Co. Named the Model CR, the closer was designed for use under hazardous conditions such as gaseous and explosive atmospheres, or when handling inflammable materials.

Total weight of the CR bag closer is 9½ lbs., complete with a cone or thread. It is available with or without the Faseal taping attachment. For literature,

CIRCLE 159 ON SERVICE CARD

THAYER BRIDGE BREAKER AGITATES MATERIAL

A new type vibrator to break bridging of materials in storage bins, supply ducts and containers has been developed by Thayer Scale Corp.



While vibratory means are employed, Thayer says the vibration is not applied directly to the side walls of the hopper or duct, but rather to screens which are inserted within the chamber and extend downward to the lower opening or discharge outlet. By this arrangement, a relatively small mass of steel is agitated to break the bridge of the material between the side walls of the container.

The bridge breaker can be furnished in various sizes and shapes to suit existing hoppers and ducts. For further details,

CIRCLE 160 ON SERVICE CARD

VULCAN CONTAINERS ADDS TWO NEW SIZES OF DRUMS

Vulcan Containers Inc. has expanded its production to include new open head grease drums and 15 gallon open and tight head drums with the new universal diameter of 13 15/16 inches as a production standard. The line complies with federal, military and Interstate Commerce Commission specifications, states the manufacturer.

All drums are available with plain steel, rust preventative or hi-bake protective interiors; indented to provide higher stacking; painted solid colors, striped, lithographed or silk screened to meet customer requirements.

Suppliers' Briefs

Bemis Bro. Bag Co. has appointed W. D. Stohlman, former manager of the Norfolk bag factory and Sales Div., as midwestern representative of the Bemis Cotton Dept. L. H. Goff, Jr., plant superintendent, succeeds Stohlman as manager at Norfolk.

J. I. Case Co. Promotion of Don A. Beckenbaugh to the newly created position of sales and manufacturing administrator has been announced.

The Chemical Rubber Co. has opened a branch warehouse and sales office at 9974 Springfield Pike, Cincinnati, O. District sales manager in charge of operations is Lloyd Mountford, formerly district sales engineer. John Saunders continues as office manager.

Continental Can Co. Raymond G. Fisher will fill the new post of vice president in charge of marketing for Continental Can in New York City.

Delta Tank Mfg. Co., Inc. Lewis W. Lubenow has been named sales manager for the Semi-Bulk Handling Dept. of the company's Materials Handling Equipment Div. He will headquarter at Delta's New York City office.

Dorr-Oliver Inc. has elected James B. Hoxie as vice president for production and Albert L. Morris as vice president for company relations.

Falls Industries. On May 1 W. R. Carlisle became sales engineer. His territory includes Ohio, West Virginia and western Pennsylvania.

Fulton Bag & Cotton Mills. Kenneth R. Fischer has been named to the sales staff. Working out of St. Louis, he will cover Missouri, Tennessee, Arkansas, Nebraska, Kansas, southern Iowa and western Illinois for the Textile Div.

Highway Equipment Co. Appointment of Gale E. Allen as general sales manager has been announced by A. F. Clauss, vice president and general manager.

Union Bag-Camp Paper Corp. received the Direct Mail Advertising Association's Gold Mailbox Award in 1957 for its direct mail campaign about the company's line of multiwall paper bags.

Vulcan Containers, Inc. Herbert F. Fagot has been named to the Chicago sales staff.

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AG CHEM COURSE PLANNED AT NEW YORK INSTITUTE

An agricultural chemical technology curriculum has been established at the State University of New York Agricultural and Technical Institute at Morrisville. Students in the curriculum will be trained for laboratory and field work, including testing and development of inseciticides, fungicides and herbicides.

The following members of the Advisory Committee and Institute officials have met to discuss the course content: Robert Nurnberger, associate professor of agriculture, Morrisville; Dr. John Van Geluwe, director of research and development, GLF Soil Building Service; Dr. Curtis L. Mason, director of technical services, Niagara Chemical; Royson N. Whipple, director of the State University Institute at Morrisville; L. Robert Crane, chairman of the agricultural division, Morrisville; Carl D. Fischer, assistant to the manager, Agricultural Chemicals Div., Union Carbide Chemicals Co. and George O. Metzler, director of student services at the Institute.

MILLER CHEMICAL TO MAKE AND MARKET FUNGICIDE 658

Union Carbide Chemicals Co., Div. of Union Carbide Corp., has licensed Miller Chemical and Fertilizer Corp. to manufacture and market fungicide 658, formerly sold by Carbide as Crag fungicide 658.

Miller Chemical will sell the finished product to vegetable, fruit and peanut growers through established distribution channels, according to Carbide.

THIODAN STOPS APHID IN ARS EXPERIMENTS

Thiodan, manufactured by Niagara Chemical Division of Food Machinery and Chemical Corp., has controlled the green peach aphid that attacks potatoes in the Pacific Northwest. In Agricultural Research Service experiments, an emulsion spray of one pound of Thiodan in 10 gallons of water per acre, applied by aircraft, has given 90 to 99 per cent control. This is reported to have been better than the same dosage in kerosene, or as a 60-mesh granule dust, or 325-mesh impregnated dust.

ARS entomologists also found that Thiodan killed relatively few of the larvae or adults of the coccinella, a beneficial insect that feeds on the aphids.

Chemically, Thiodan is hexachloro-hexahydro-methano-2,4,3,-benzodioxathiepin oxide.

Registered label recommendations include use for control of Colorado potato beetle, flea beetle, leafhoppers and aphids.

SEVIN OK'D FOR TEST USE ON PEARS, BEANS, GRAPES

Experimental labels covering the use of Sevin insecticide for control of insects attacking pears, beans and grapes have been accepted by USDA, according to Dr. R. H. Wellman, manager, Crag Agricultural Chemicals Dept., Union Carbide Chemicals Co.

FDA has established a temporary tolerance of 10 ppm for the new insecticide under provisions of the Miller Amendment. Sevin can be sold in limited quantities to experienced growers —for field testing only—on pears, beans and grapes.

USDA REGISTERS CO-RAL FOR USE ON LIVESTOCK

CO-RAL has been registered by USDA for the control of cattle grubs, screw-worms, hornflies, lice and ticks on livestock, Chemagro Corp. has announced. Formerly known as Bayer 21/199, CO-RAL has not been registered for the treatment of dairy animals.

A 25 per cent wettable powder, it is mixed with water and applied with conventional pressure spray equipment. In the control of cattle grubs, Chemagro says only one treatment per year is required if it is applied soon after heel fly activity ends.

TOLERANCES ESTABLISHED BY FDA FOR TRITHION

Residue tolerances for Trithion, 0,0-Diethyl 5-p-chlorophenyl thiomethyl phosphorodithioate, the insecticide-miticide developed by Stauffer Chemical Co., have been established by the Food and Drug Administration for many major food crops. The new regulations permit use of the organic pesticide on 36 additional food crops.

Tolerances just established are: 0.8 ppm—apples, pears, crabapples, quinces, apricots, beans (succulent forms of snap beans, lima beans, soybeans), cantaloupes, cherries, eggplant, garden beets (both tops and roots), grapes, olives, peaches, nectarines, peas, peppers, pimentoes, plums, prunes, spinach, strawberries, tomatoes and watermelons; 2 ppm—almond hulls, oranges, grapefruit, lemons, limes, tangelos and tangerines; 5 ppm—sugar beet, both roots and tops.

GLYCERINE AIDS IN SOIL ADDITIONS IN AUSTRALIA

Effectiveness of additions of molybdenum and other elements to deficient soils is enhanced when the nutrients are combined with glycerine (Australia Patent Application 19645/56). The glycerine increases moisture retention of soils and improves its agricultural characteristics, according to the patent.

The combination of a polyhydric alcohol and the trace elements, it was noted, provides substantially greater benefits than either component used separately.

As stated in this patent, glycerine is applied to the soil in the form of a dilute aqueous solution which forms a layer under the soil when washed in by the first rain. Experiments indicate that plants grown on treated soil will give greatly improved yields and require much less rainfall.

TVA CONTRACT TO ACP

A contract has been awarded by the Tennessee Valley Authority to American Chemical Paint Co., for 2,4-D and 2,4,5-T acids totaling $251,500.

Patent Reviews

FC

By Dr. Melvin Nord

PRODUCING POTASSIUM DIHYDROGEN PHOSPHATE

U. S. 2,824,785, issued Feb. 25, 1958 to Menahem Merlub-Sobel, assigned to Horizons Inc., relates to the production of potassium dihydrogen phosphate, sodium chloride and sodium phosphates.

The basic chemical reaction involved is

$$NaH_2PO_4 + KCl \rightarrow KH_2PO_4 + NaCl$$

The process consists in interacting monosodium phosphate (NaH_2PO_4) and potassium chloride (KCl) in a heated aqueous solution, preferably as concentrated as possible. The temperature and concentration are such that complete solution of both the NaH_2PO_4 and KCl is achieved. Then the solution is cooled to any convenient and economically justifiable temperature to precipitate the greater portion of the potassium dihydrogen phosphate (KH_2PO_4) present, in crystalline form.

After the crystals are separated from the mother liquor, they are washed with ice water and then dried at 110° C. The mother liquor is treated with sufficient soda ash and/or caustic to reach a pH level corresponding to Na_2HPO_4 or Na_3PO_4. Because of the relatively low solubility of each of these salts at temperatures below 20° C., the phosphate values are readily precipitated as the hydrated sodium salts and are recovered by conventional means.

The remaining liquid, which is now substantially less corrosive than the unneutralized liquid, is then heated. The neutralized liquid contains any potassium not recovered as KH_2PO_4. Heating is continued to boil off a portion of the water, and during this step sodium chloride is thrown out of solution. When the equilibrium point for the system KCl-NaCl-H_2O is reached at the temperature of evaporation, the sodium chloride is filtered off. In order to recover the potassium values, the mother liquor is employed in the preparation of the original hot solution of NaH_2PO_4 and KCl in a repetition of the process.

RECOVERING AMMONIA FROM AMMONIUM CHLORIDE

U. S. 2,823,981, issued Feb. 18, 1958 to Charles H. Fuchsman and assigned to Columbia-Southern Chemical Corp., describes a process for recovering ammonia from ammonium chloride in the production of sodium carbonate by the ammonia-soda process.

The ammonium chloride is contacted with magnesium oxide in the presence of sufficient water vapor to prevent formation of magnesium chloride. By this means the magnesium oxide is converted to MgOHCl,

$$NH_4Cl \rightarrow NH_3 + HCl$$
$$HCl + MgO \rightarrow MgOHCl$$

The resulting MgOHCl, upon heating, decomposes into MgO and HCl.

DEFOLIATING PLANTS

U. S. 2,825,640, issued March 4, 1958 to Richard D. Northcraft, and assigned to E. I. du Pont de Nemours & Co., discloses the use, as defoliants, of polyhalogenated polyenoic acids (such as 2,3,4-trichloro-2,4-pentadienoic acid, or 4,5,6,6-tetrachloro-3,5-hexadienoic acid), dispersed in a non-solvent diluent.

The defoliant compositions are applied either as a spray or a dust to the foliage to be removed. The use of a non-solvent diluent permits a reasonably uniform distribution of an effective amount of active ingredient even when such methods as dusting or spraying from an airplane are employed.

The compounds are effective even at low rates of application. The compositions have been found to be effective, giving practically 100 per cent defoliation, when used in rates of 10 pounds per acre. Under ideal conditions, lesser amounts, say down to 1 pound per acre, can be used but in general an application of from about 2 to 20 pounds per acre of the active ingredient is preferred for cotton plants.

SOIL CONDITIONING AND STABILIZING WITH DEXTRANS

U. S. 2,822,643, issued Feb. 11, 1958 to Everette E. Witt and Leo J. Novak, assigned to The Commonwealth Engineering Co. of Ohio, provides a method for soil conditioning and stabilizing with a composition containing low molecular weight dextran.

According to the inventors, it has been found that Krilium may be diluted or extended with dextran having a molecular weight of 5,000 to 50,000 without any serious reduction in the effectiveness as conditioner and stabilizer for soil consisting of clay, silt and sand particles, and with improvements in the stability of the sand particles resulting from the specific effects of the dextran on the sand particles.

It has also been found that high molecular weight dextrans (in the millions), such as occur in "native" dextran, are specifically and selectively effective in stabilizing, in the form of small aggregates or "crumbs," the fine particles of which clay and silt are composed; whereas, low molecular weight dextrans (5,000 to 50,000), are specifically and selectively effective in stabilizing, in the aggregate condition, the coarse particles or grains of which sand is composed. Therefore, different blends of the two may be prepared in order to provide effective stabilization of different kinds of soil.

FERMENTING MUNICIPAL REFUSE DISPOSAL

U. S. 2,823,106, issued Feb. 11, 1958 to Norman A. Pierson, and assigned to Naturizer Co., describes a process of composting municipal refuse and sewage into an organic humus suitable for use as a soil conditioner.

Refuse collecting trucks dump the refuse in windrows. The pile of refuse is then rolled, to provide a compacting of the refuse. The compacted pile is then wetted and inoculated with bacteria, to in-

duce a speedy anaerobic decomposing activity. Subsequently the windrows are turned to loosen the refuse and provide an aerobic bacterial action. After repeated wetting and rolling of the refuse, it is completely decomposed into an organic humus. The compost may then be screened to provide an end product suitable for bagging and commercial use. All of the refuse is composted, except glass, plastic, thick metal articles, rocks, and extremely large pieces of wood. Substantially all tin cans and rubber articles, such as tires, are decomposed.

PROCESS FOR TREATING SYSTEMIC PLANT DISEASES

U. S. 2,823,158, issued Feb. 11, 1958 to Chien-pen Lo, and assigned to Rohm & Haas Co., provides a process for controlling or inhibiting plant diseases by applying to the plant environment N-cyanoethylcarbazole, which may be prepared by reacting carbazole with acrylonitrile.

It may be applied to prevent damage from invasion of plants by pathogens or to mitigate or overcome the effects of the invasion of plants by pathogens. Application may be made by applying to the roots a suspension or dispersion of the compound, by application to the leaves by spraying or dusting, or it may be applied by injection.

MICRO-NUTRIENT COMPLEXES FOR FOLIAR APPLICATION

U. S. 2,823,107, issued Feb. 11, 1958 to John R. Allison and assigned to Leffingwell Chemical Co., relates to inorganic micronutrient complexes so composed as to supply the plants' deficiencies in phosphorus, manganese, and zinc. The product is used in a liquid carrier, for application to plant foliages.

The invention involves the concept of making a water insoluble salt complex of zinc and manganese salts, including phosphate salts, which after application to the plant foliage, has prolonged effectiveness in assuring the availability to and assimilation by the plant of zinc, manganese and phosphorus deficiencies, by reason of the action upon the salt complex of the natural slightly acid condition of the plant foliage surface. Thus, although having substantial water insolubility, the complex is capable in the presence of slight acidity created naturally by the plant on its foliage surfaces, and resulting also from atmospheric carbon dioxide, of releasing the named metallic elements for plant assimilation.

The patent describes methods for making such complexes.

PROCEEDINGS AVAILABLE

Copies of the *Proceedings of the Fertilizer Industry Round Table* are still available. Included in the 96-pages are sections on materials, formulations, granulation, ammoniation, instrumentation, liquid fertilizer and effluents, and a list of participants. Send checks for copies at $2.50 each to Dr. Vincent Sauchelli, National Plant Food Institute, 1700 K Street N. W., Washington 6, D. C.

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PEST REPORTS

Presented in cooperation with the Economic Insect Survey Section, Plant Pest Control Branch, Agricultural Research Service, USDA.

NEW INSECT DISTRIBUTION RECORDS

ALTHOUGH there was no spectacular spread of any one insect in 1957, numerous finds were recorded for the first time in various states.

The spotted alfalfa aphid, which spread so rapidly after it was first reported in this country in New Mexico in 1954, was reported from only one new state in 1957—Ohio. In that state this pest of alfalfa was reported from southwestern counties.

The alfalfa weevil, long known to be in the western part of the United States, has spread rather rapidly in the east since being first found in New Jersey, Maryland and Virginia in 1952. It was reported for the first time in 1957 from three additional eastern states: South Carolina, Connecticut and Massachusetts.

Two new cereal and forage insects were found in Louisiana during 1957, a clover weevil (*Hypera meles*) and the sweetclover aphid. The vetch bruchid was a new record for Illinois. California reported both the sweetclover weevil and Rhodes-grass scale for the first time and the velvetbean caterpillar continued its northward movement having been taken in Delaware.

In New Mexico an aphid (*Asiphonella dactylonii*) was found on grass. This 1957 New Mexico record was also a first find for this insect in the United States.

The potato psyllid which causes the important psyllid yellows in potatoes and tomatoes was taken for the first time in Kansas. Another new record of an important vegetable insect was the finding of the pepper weevil in New Jersey.

Four forest insects reported in 1957 for the first time from Oregon were the birch leaf miner, the European alder leaf miner and two conifer aphids (*Cinara gentneri* and *C. schuhi*). The larch casebearer was a new pest record for Idaho as were the spruce needle miner and a spruce aphid (*Cinara piceicola*) for California. In Illinois the mimosa webworm was reported for the first time in 1957 as was the Fuller rose beetle in Indiana.

In Utah an aphid (*Cavariella archangelicae*) on oak was a new pest record. This may also be a new record for the United States.

STORED-PRODUCTS INSECT SURVEYS INTENSIFIED

Interest created by the finding of the khapra beetle in three western states—California, Arizona and New Mexico—in 1953–54 has been responsible for an intensification of stored-products insect surveys. During 1957 dermestid (*Trogoderma parabile*) and a tenebrionid (*Tribolium destructor*) were reported for the first time in Washington State. A dermestid (*Thylodrias contractus*) was a new record for California. In Idaho a new record was the grain moth (*Haplotinea ditella*). Evidently this is also a new record for the United States.

In Texas the termite (*Kalotermes approximatus*) was reported for the first time in 1957.

The insects reported upon do not include all the new state insect distribution records for 1957 but do illustrate the continuous spread of pests in this country. This spread emphasizes the need for constant vigilance for spread of pests already known to be in the United States and the establishment of pests new to the country.

GENERAL INSECT ACTIVITY

The pea aphid was active on legumes from East to the West Coast by early May. Pea aphids were common throughout Delaware and Maryland and local heavy infestations were reported from Pennsylvania and Virginia. Heavy infestations were present in Georgia, Alabama and Tennessee. North Carolina, Illinois, Texas, Oklahoma, Kansas, Missouri, Louisiana and Nebraska were among some of the others reporting activity. In Utah populations were threatening in local areas. Nevada reported populations abnormally high in Clark and Nye Counties with some control being applied. Light populations were present in Colorado and populations were building up rapidly in New Mexico. Build-ups were also reported from the Willamette Valley of Oregon.

The alfalfa weevil, a relatively new pest in the East, was causing damage by late April. Activity was reported from Pennsylvania, Delaware and Maryland. Damage in Virginia ranged from medium to heavy in most counties where the weevil is present. Unsprayed fields in Union and Wake Counties, North Carolina were a total loss from this weevil. Although reported from Georgia for the first time in 1958, the alfalfa weevil is known to be widespread in the state. In early May, eight Georgia counties reported light to moderate infestations and five moderate to heavy. Light injury was reported from the Boise Valley of Idaho and treatment was necessary in the central and northern areas of Utah. Adult control was required in Montrose County, Colorado.

The first armyworm larvae in Kansas were reported in early May. Armyworm moths were caught as far north as Lincoln, Nebraska and Urbana, Illinois and were active in the Richmond, Va. area. *(Continued on page 64)*

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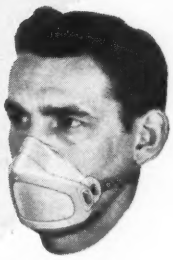

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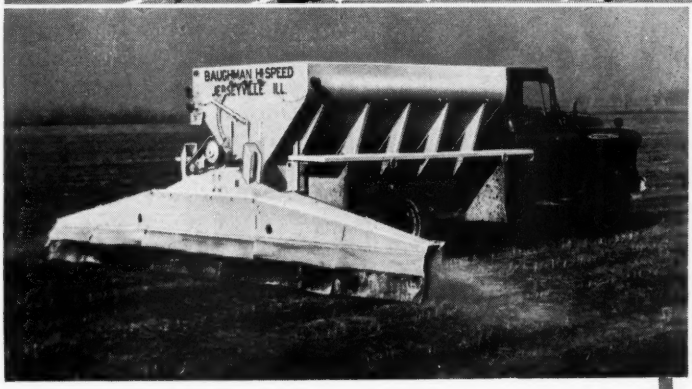

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Fertilizer Materials Market

FC

New York

May 20, 1958

Sulfate of Ammonia. This material was definitely in short supply. No relief was expected during the current fertilizer season unless the steel business picks up sharply, and this is not looked for in the immediate future.

Ammonium Nitrate. A better movement was reported, particularly in view of the tight supply of sulfate of ammonia. Several large export inquiries were in the market for shipment to the Far East.

Urea. Some export inquiries from the Far East were in the market and domestic demand held fairly well. No price changes were noted.

Nitrogenous Tankage. This material remained in tight supply for both prompt and future shipment as production dropped at some producing plants. The market was nominal at $3.50 to $4. per unit of ammonia ($4.25 to $4.86 per unit N) f.o.b. production points.

Castor Pomace. Some sales were made of this material at $37.50 per ton, f.o.b. production points, with further quantities available. Most buyers considered this an excellent organic material at current prices.

Organics. Trading was quiet in organic fertilizer materials as demand from the feed trade showed signs of slackening up some. Blood sold at $6.50 per unit of ammonia ($7.90 per unit N) f.o.b. Eastern points and tankage sold at $6.75 per unit of ammonia ($8.20 per unit N) f.o.b. New York. Soybean meal was definitely easier in price and last sold at $53 per ton in bulk, f.o.b. Decatur, Ill. Cottonseed meal was available in bags at $63 per ton, f.o.b. Memphis with linseed meal in a tight position because of the small supply of linseed available.

Fish Meal. With the approach of the new fishing season most buyers were content to await further developments. Producers were asking $132 per ton, f.o.b. fish factory for 60 per cent Menhaden fish meal with some scattered lots of imported fish meal offered from time to time at competing prices.

Bone Meal. At some points there was actually a shortage of bone meal because production has dropped. Last sales were made on the basis of $65 per ton, f.o.b. production points, with some imported feeding grade selling at around the same price at various ports.

Hoof Meal. Hoof meal was in heavy demand by industrial users with last sales made on the basis of $6 per unit of ammonia ($7.29 per unit N) f.o.b. Chicago. Little material was available.

Superphosphate. With sulfuric acid in a rather weak position at some Eastern points, there was some speculation among buyers as to whether this would eventually effect the price of superphosphate. Demand for triple superphosphate was said to be holding up fairly well.

Potash. Since the announcement of potash prices for new fertilizer season, bookings were said to be rather small. Most buyers wanted to get a little clearer picture of the results of the present season, both as to tonnage and prospective business.

Philadelphia

May 20, 1958

Movement of materials in April was reported to be quite satisfactory and some grades were extremely active. The present month is running about normal and it is thought the season will wind up probably 10 to 15 per cent below last year.

Sulfate of Ammonia. This continues in exceedingly short supply, since practically no coke-oven grade is obtainable.

Ammonium Nitrate. Supply is sufficient to meet requirements, and recent business has been very satisfactory. It is expected final deliveries will bring this season up to last year.

Nitrate of Soda. Demand is rather quiet but is expected to pick up presently for direct application and top dressing. Prices remain unchanged.

Urea. Market is somewhat easier but 45 per cent agricultural grade is still listed at $110 per ton.

Blood, Tankage, Bone. Blood and tankage were subject to considerable fluctuation during the past month and are now both listed at $8 per unit of ammonia ($9.72 per unit N) in Chicago area. They are both $6.50 per unit ($7.90 per unit N) in the New York area. Bone meal is quoted at $65 per ton.

Castor Pomace. Still quoted nominally at $40 per ton.

Fish Scrap. Supplies are moderate with fair demand. Menhaden meal is quoted at $133 per ton, and scrap at $128 to $129 per ton.

Superphosphate. Prices remain listed at 90 cents to 93 cents per unit APA per ton for the normal grade, and 98 cents per unit for triple. Supplies are plentiful.

Potash. Shipments during April are reported to have been record breaking, and present demand is fairly satisfactory.

Los Angeles

May 6, 1958

Sulfate of Ammonia. Market is strong. Although there are ample supplies at present, producers expect to be short before end of spring.

Ammonium Nitrate. There is a steady demand but supplies appear to be adequate.

Urea. This item is moving in fair volume and supplies are ample.

Castor Pomace. Demand is light, with some sales at $30 per ton, f.o.b. producer's plant.

Bone Meal. This is nominal at $65 per ton.

Blood Meal. Demand is good, mostly from feed trade. Recent sales have been at $7.75 per unit of ammonia ($9.42 per unit N).

Tankage. Demand is strong and most producers are sold up for 30 days at $5.50 per unit of ammonia ($6.68 per unit N).

Fish Meal. Recent price has been $2.30 per unit of protein ($149.50 per ton), with imported meal at about 5 cents per unit less.

Potash. Shipments have been slow, considerably behind last year. Supplies are ample.

PEST REPORTS

(Continued from page 62)

An outbreak of banded-winged grasshoppers (*Trimerotropis pallidipennis*) was occurring on 276,000 acres in Buckeye-Casa Grande area of Arizona. The species, which is normally not regarded as a serious pest, was moving from range to croplands and threatening young cotton. A cooperative control program has been completed in Arizona on a total of 138,450 acres. Heavy infestations have been reported also from southern Utah and Clark County, Nevada.

Aphids were among the most active fruit insects during late April and early May. In Indiana aphids were increasing on apples in the Orleans area and heavy populations were reported from apple trees in Lee County, Alabama. Extremely heavy aphid populations were damaging peach leaves in areas of New Mexico and Utah. Pennsylvania reported heavy population on apples in the south central area and Nevada had increasing populations on cherry in Washoe County. Catfacing insects were active in parts of Indiana, Illinois and Missouri.

Vegetable insects in general were rather light during this reporting period. Alabama, however, reported local damaging infestations of the vegetable weevil, turnip and cabbage aphids and the imported cabbageworm. Tomatoes in the lower Rio Grande Valley of Texas were being damaged by mites and tomato worms.

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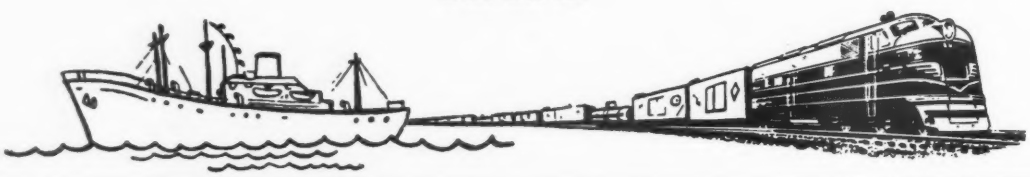

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H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Phillips Chemical Co., Bartlesville, Okla.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TALC

Ashcraft-Wilkinson Co., Atlanta, Ga.

TANKAGE

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.

H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

TANKS—NH3 and Liquid N

Cole, R. D., Manufacturing Co., Newman, Ga.

TOXAPHENE

Ashcraft-Wilkinson Co., Atlanta, Ga.

TRUCKS—SPREADER

Baughman Mfg. Co., Jerseyville, Ill.

UREA & UREA PRODUCTS

Allied Chemical Corp., Nitrogen Div., N. Y. C.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
E. I. duPont de Nemours & Co., Wilmington, Del.
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Sohio Chemical Co., Lima, O.

UREA-FORM

E. I. duPont de Nemours & Co., Wilmington, Del.

VALVES

Monarch Mfg. Works, Inc., Philadelphia, Pa.

ZINC SULFATE

Tennessee Corp., Atlanta, Ga.

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